Missouri
Approved TMDLs

Missouri River
Chlordane and PCB

11/03/2006

MISSOURI TMDL FILES

REGIONAL 303(D) & TMDL PROGRAM SUPPORT FILES

Note: Records Center reference is
WQMB/TMDL APPROVAL AND PROGRAM FILES/ADMINISTRATIVE RECORD

State Developed: Missouri River – Chlordane and PCB

Section 1: Draft TMDL

Date	Document Type	Document Description
06/09/2006	Announcement and TMDL	Draft TMDL put on Public Notice
06/12/2006	phone log	Comment from Tim Gans, Missouri American Water Company
06/14/2006	phone log	Comment from John Drew, MO DNR Water Resources Program
06/23/2006	Letter	Comment from MO Dept of Health and Senior Services
07/05/2006	Letter	Comment from US EPA Region 7
07/07/2006	Letter	Comment from MO Dept of Conservation
07/10/2006-07/25/2006	email string	Comment from Upper Mississippi River Team
08/22/2006	Letter	MO DNR response to MO Dept of Health and Senior Services
08/22/2006	Letter	MO DNR response to US EPA Region 7
08/22/2006	Letter	MO DNR response to MO Dept of Conservation
08/22/2006	Letter	MO DNR response to Upper Mississippi River Team
08/30/2006	Second Announcement and TMDL	Second Draft TMDL put on Public Notice

Section 2: Final TMDL

Date	Document Type	Document Description
10/11/2006	Letter and TMDL	Final TMDL submitted to EPA

Section 3: EPA Review of State Developed TMDLs

Date	Document Type	Document Description
07/05/2006	Letter	EPA comment letter on Public notice version
08/24/2006	Letter	Response Letter to EPA comment
10/30/2006	Report	TMDL/Decision Document QC Check

Section 4: Final EPA Approved TMDL

Date	Document Type	Document Description
11/03/2006	Letter	Approval Letter to MDNR
11/03/2006	Concurrence Copy	Routed Approval Letter to MDNR with Concurrences
11/03/2006	Report	R7 TMDL Review Documents

Section 5: ESA Informal Consultation

Date	Document Type	Document Description
08/18/2006	Email	ESA Concurrence Memo to FWS on Missouri River

Section

1

Water Protection Program

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Public Notice

Beginning Date: June 9, 2006
Ending Date: July 9, 2006

Name: Draft Missouri River Total Maximum Daily Load (TMDL)
Location: Across 25 Missouri Counties

Purpose: A draft copy of the Missouri River TMDL is available for public review and comment.

Description: The Missouri River is listed for impairment due to elevated levels of Chlordane and Polycholorinated Biphenyls (PCBs) in fish tissues. Both chlordane and PCBs are now banned. Therefore, the TMDL proposes continued monitoring of the Missouri River to assure that levels of these pollutants are decreasing. Section 303(d) of the Clean Water Act requires a listing of impaired waters. All waters on this list are required to have a TMDL written for them. These are water bodies that do not meet the Missouri Water Quality Standards even after implementing existing regulatory programs. A TMDL document provides background information on the water body, a calculation of the maximum pollutant load the system can incorporate without being impaired, an implementation plan to restore water quality and, in some instances, a continuous monitoring plan. The Missouri River Information Sheet provides background material for this TMDL document.

Obtain a Copy: Copies of the TMDL can be obtained by calling the department's Water Protection Program (WPP) at 1-800-361-4827 or (573) 751-6623.

Draft Missouri River TMDL
www.dnr.mo.gov/env/wpp/tmdl/missouri-r-draft-tmdl.pdf

Missouri River TMDL Information Sheet
http://www.dnr.mo.gov/env/wpp/tmdl/info/missouri-r-chlor-pcb-info.pdf

General TMDL information
http://www.dnr.mo.gov/env/wpp/tmdl/index.html

Invitation to Comment: The interested public is encouraged to participate in this process if they have concerns regarding the content of this document or if they would like to provide written support for the process. The program will accept written comments regarding the Missouri River TMDL through July 9, 2006.

Address: Comments should be sent to: Department of Natural Resources, WPP, Water Quality Monitoring and Assessment Section, P.O. Box 176, Jefferson City, MO 65102-0176

For more Information: For more information on TMDL issues, see the U.S. Environmental Protection Agency (EPA) Web site at www.epa.gov/owow/tmdl/

For an explanation of Total Maximum Daily Loads, see the *Total Maximum Daily Loads* PDF fact sheet.

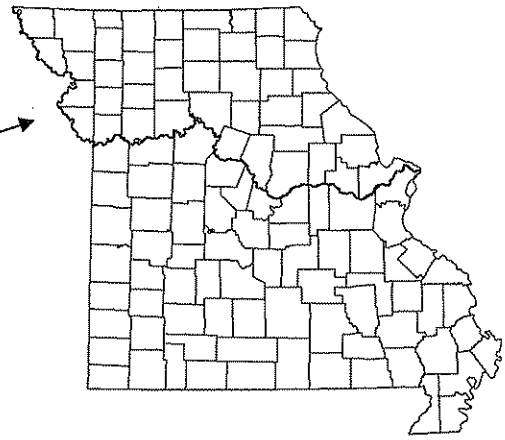
Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

Missouri River

Waterbody Segment at a Glance:

Counties: Twenty-five counties
Nearby Cities: Numerous cities and towns
Length of impairment: 533 miles (highlighted on map)
Pollutant: Chlordane and Polychlorinated Biphenyls (PCBs) in fish
Source: Many point/non-point sources



TMDL Priority Ranking: High

Description of the Problem

Beneficial uses of Missouri River

- Livestock and Wildlife Watering
- Protection of Aquatic Life and Human Health – Fish Consumption
- Whole Body Contact, Category B
- Secondary Contact Recreation
- Irrigation
- Drinking Water Supply
- Industrial

Use that is impaired

Protection of Human Health - Fish Consumption

Standards that apply

- The action level for Chlordane in fish tissue, established by the U.S. Food and Drug Administration (FDA) is 0.3 milligrams per kilogram (mg/kg) or parts per million (ppm).
- The FDA sets a 2.0 mg/kg limit on interstate shipment of fish for human consumption. The U.S. Environmental Protection Agency sets a human health screening level of 0.01 mg/kg on PCBs in fish.

Background information and Water Quality Data

Prior to 2001, the Missouri Department of Health and Senior Services maintained a fish consumption advisory on all waters in the state outside the Ozark Plateau. This advisory, which included the Missouri and Mississippi Rivers, recommended consumption of no more than one meal per week of carp, catfish, buffalo, drum, sucker or paddlefish due to chlorinated hydrocarbon pesticides such as Dieldrin, Chlordane and DDT. The Department of Health and Senior Services lifted this advisory in 2001 due to declining levels of these chemicals in most fish species. The current advisory (2004) replaced the lifted advisory for the Missouri and Mississippi Rivers. This advisory recommends that no sturgeon or sturgeon eggs should be eaten due to elevated levels of Chlordane and PCBs.

Chlordane is a pesticide that was commonly used in the past for termite control. It was also used at nurseries, on golf courses and in agriculture. Chlordane was banned for agricultural use in 1975 and for all uses in 1988, but (due to its persistence) eroding contaminated soil can provide a continuing source of Chlordane to streams and lakes. PCBs are a mixture of up to 200 different chlorinated compounds and are stable under conditions of high pressure and high temperature. PCBs were commonly used in transformers and other electrical equipment such as fluorescent light fixtures as coolants and lubricants and were also used as hydraulic oils. U.S. production ended in 1977 due to concerns about the persistence of PCBs in the environment. Chlordane and PCBs degrade very slowly and bio-accumulate in fish tissue, particularly in bottom-dwelling/feeding fish. Table 1 below gives information on the levels of these two chemicals in sturgeon in the Missouri River within or where it borders the State of Missouri.

Table 1. Average Annual Levels of Chlordane and PCBs (in mg/kg) of All Samples in the Missouri River Within or Bordering the State of Missouri.

Year*	Number of Fish in Sample**	Number of Samples collected	Missouri River Average of all sampling sites	
			Chlordane (Standard 0.3)	PCBs (Standard 0.01)
1997	51	5	3.0060	2.2776
1998	40	2	1.6225	1.2250
1999	40	4	2.2063	0.8231
2000	5/61	1/ 5	0.9000	0.4335
2001	15	3	2.9400	2.0300
2002	58	3	No sample	0.9390
2004	92	25	No sample	2.5139

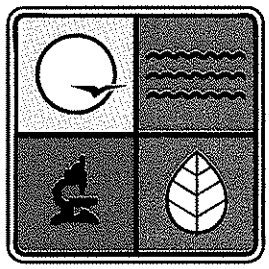
*Data may be from different locations within a given year and between years.
**The first number is the number of fish or samples collected for Chlordane the second number for PCBs

The department recognizes that data collected to date does not always reflect a downward trend of PCBs or Chlordane on a year-to-year basis. However, this is most likely due to collection inconsistencies. Some years of data contain tissue samples of many different fish species but some years contain only one or two species of fish. Fatty fish, such as carp, tend to absorb more PCBs than a less fatty fish such as catfish. Likewise, feeding habits, rainfall and age and size of the fish can effect the amount of sediment (thus PCBs and Chlordane) assimilated by fish or the bio-accumulative effect. The most recent data predominately sampled catfish and sturgeon, however in 2004, only sturgeon was sampled. This would tend to show increasing levels of PCBs and Chlordane in later years and obscure the overall downward trend.

As mentioned, these pollutants degrade slowly and are extremely persistent in the environment. However, since they are no longer produced, a downward trend is inevitable and the department recommends the development of a consistent protocol for measurement of the pollutants in fish tissue and continued sampling.

For more information call or write:

Missouri Department of Natural Resources
Water Protection Program
P.O. Box 176
Jefferson City, MO 65102-0176
Office 1-800-361-4827 or (573) 751-1300
Fax (573) 522-9920
Program Home Page: www.dnr.mo.gov/env/wpp/index.html

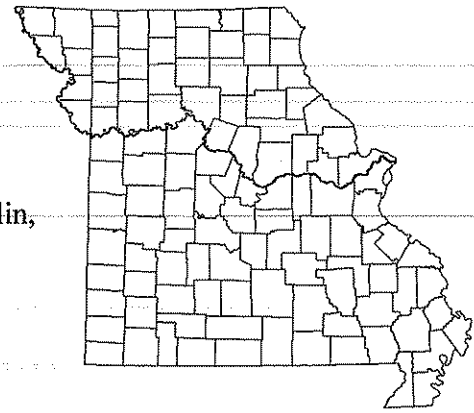


Missouri Department of Natural Resources
Water Protection Program

Total Maximum Daily Load for Chlordane and Polychlorinated Biphenyls in Missouri River

Draft Final June 9, 2006

Draft Total Maximum Daily Load (TMDL)
For Missouri River
Pollutant: Chlordane and Polychlorinated Biphenyls (PCBs) in Fish Tissue



Name: Missouri River

Location: Across 25 counties: Atchison, Holt, Andrew, Buchanan, Platte, Clay, Jackson, Ray, Lafayette, Carroll, Saline, Chariton, Howard, Cooper, Moniteau, Boone, Cole, Callaway, Osage, Montgomery, Gasconade, Warren, Franklin, St. Charles, and St. Louis Counties

Hydrologic Unit Code (HUC): 10240001, 10240005, 10240011, 10300101, 10300102, 10300200

Water Body Identification Numbers (WBID): 1604 (100 miles), 701 (129 miles), 356 (125 miles) and 226 (179 miles)

Missouri Steam Classification: The Missouri River is classified in the Missouri Water Quality Standards (WQS) as a Class P[1] stream

Beneficial Uses for Missouri River[2]:
- Livestock and Wildlife Watering
- Protection of Aquatic Life and Human Health – Fish Consumption
- Whole Body Contact Recreation, Category B
- Secondary Contact Recreation
- Irrigation
- Drinking Water Supply
- Industrial

Pollutant: Chlordane and PCBs in fish tissue

Size of Impaired Segment: 533 miles

Pollutant Source: Many point and non-point sources

TMDL Priority Ranking: High

[1] Class P streams maintain permanent flow even in drought periods
[2] For beneficial uses see 10 CSR 20-7.0310(C) and Table (H)

1. Introduction and Problem Identification

1.1 Study Area Description:

The Missouri River is 2,565 mile long starting at its headwaters in the Jefferson, Madison and Gallatin Rivers, which converge near Three Forks, Montana to form the Missouri River. The river flows north through mountainous canyons before emerging from the mountains near Great Falls, Montana. It flows east across the plains of Montana into North Dakota, then turns southeast flowing into South Dakota and along the north and eastern edge of Nebraska. The river forms part of Nebraska's border with South Dakota and nearly its entire boundary with Iowa, flowing past Sioux City and Omaha. The river forms the entire boundary between Nebraska and Missouri and part of the boundary between Missouri and Kansas. At Kansas City, the river turns eastward and flows across Missouri where it joins the Mississippi River just north of St. Louis. The Missouri River sub-basin is the largest sub-basin in the Mississippi River basin, covering more than 500,000 square miles.

The TMDL discussed in this report is for the portion of the Missouri River that begins on the border of Iowa and Missouri, approximately 10 miles north of Watson, Missouri at River Mile 544 (Figure 1). Table A in the appendix provides a detailed description of the 25 sampling locations along the Missouri River shown in Figure 1. Land use for this 533-mile segment of the Missouri River is shown in Figure 2. Within the impaired segment, three major tributaries enter the Missouri River. These tributaries are the Platte, Blue and Osage Rivers, and their confluences are at Missouri River Miles 391, 358 and 133, respectively.

1.2 Problem Identification:

Prior to 2001, the Missouri Department of Health and Senior Services maintained a fish consumption advisory on all waters in the state outside the Ozark Plateau. This advisory, which included the Missouri River, recommended consumption of no more than one meal per week of carp, catfish, buffalo, drum, sucker or paddlefish due to chlorinated hydrocarbon pesticides such as Dieldrin, Chlordane and DDT. The Department of Health and Senior Services replaced this advisory with the 2004 advisory for the Missouri River, which recommends that no sturgeon or sturgeon eggs should be eaten due to elevated levels of Chlordane and PCBs (MDNR, 2004).

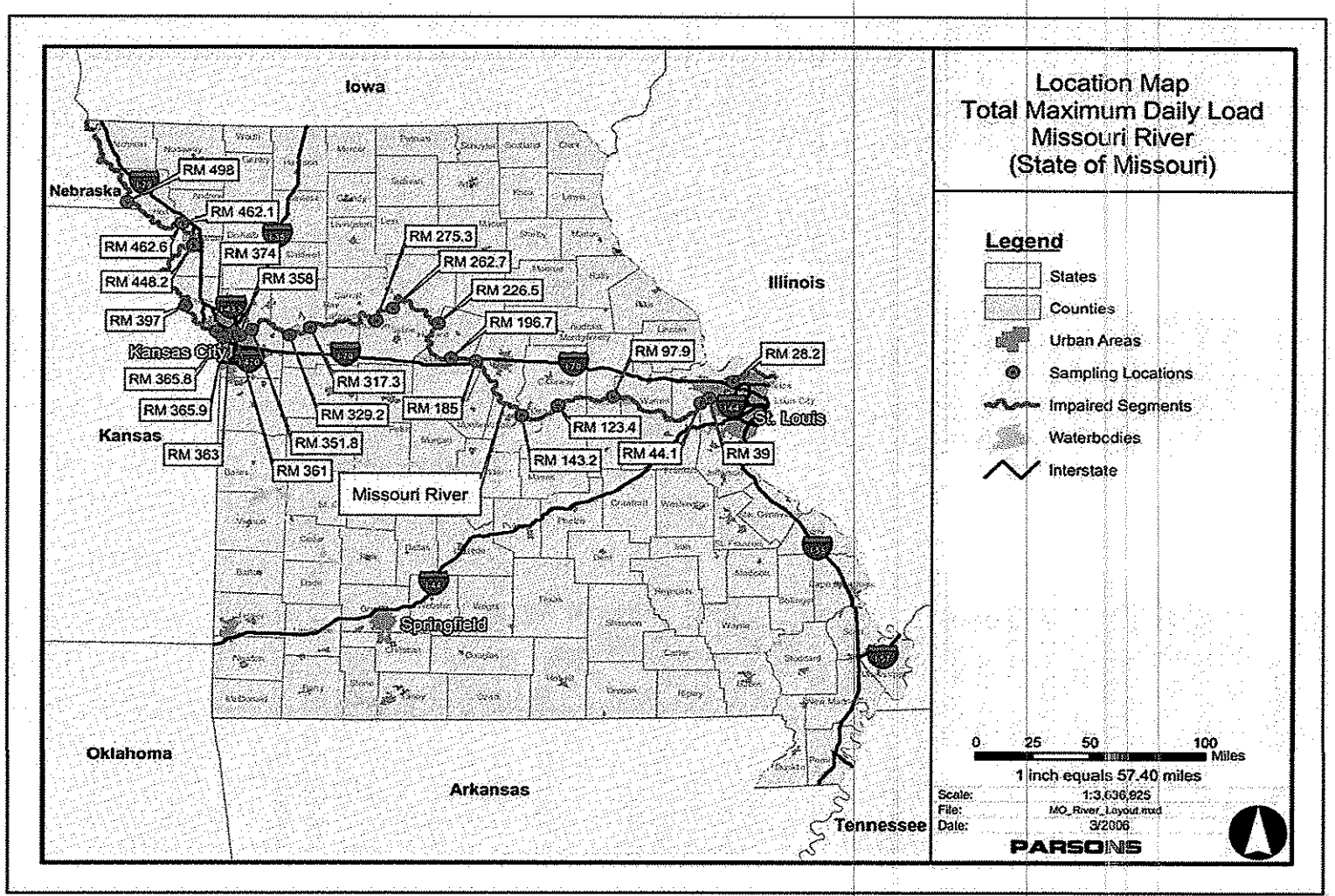


Figure 1: Location Map for Impaired Segments in Missouri River

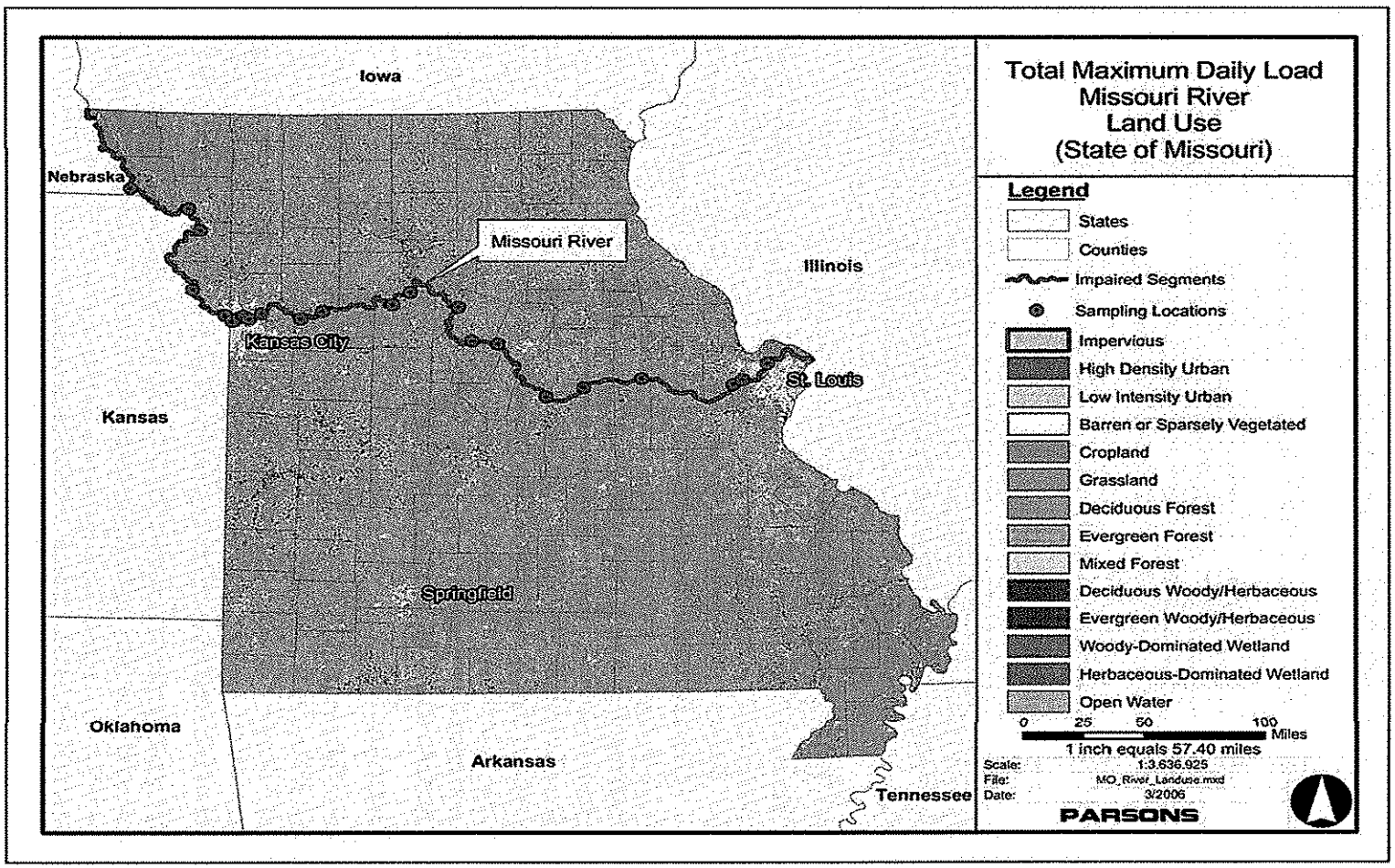


Figure 2: Land Use for Missouri River Watershed within State of Missouri

Table 1 summarizes the information on the impaired segments in Missouri River based on the 2002 303(d) listing.

Table 1: Missouri 2002 303(d) List for Impaired Segments in Missouri River

WBID	Waterbody	Size	Unit	Pollutant	Downstream County	Upstream County	Priority
701	Missouri River	129	Miles	Chlordane, PCBs	Gasconade	Chariton	High
356	Missouri River	125	Miles	Chlordane, PCBs	Chariton	Jackson	High
226	Missouri River	179	Miles	Chlordane, PCBs	Jackson	Atchison	High
1604	Missouri River	100	Miles	Chlordane, PCBs	St. Louis	Gasconade	High

2. Current Water Quality Condition and Desired Endpoint

2.1 Current Water Quality Condition:

Several agencies collected fish tissue samples at numerous monitoring sites along the Missouri River from 1978 to 2004. The goal of the fish tissue monitoring and survey program was to analyze fish tissue samples for Chlordane and PCBs in order to define water body segments impacted by contamination. Bottom feeding fish such as carp were sampled because of their feeding or dwelling preferences near the bottom of the water column where Chlordane and PCBs remain in the sediments.

Even though they have been banned, both Chlordane and PCBs degrade very slowly, making them particularly persistent in the environment. They remain in the soil for long periods of time. Because these pollutants are not soluble they cannot be found in the water column. Instead they adsorb to soil particles in lakebed or streambed sediments. Bottom-feeding fish, such as carp, become exposed to Chlordane and PCBs due to their feeding and dwelling preferences near streambeds or lakebeds where contaminated sediments persist. Fish uptake these pollutants in water through their gills and through the consumption of contaminated aquatic organisms. Once the pollutants are absorbed into the bloodstream, they accumulate primarily in fatty tissues. Once in the fatty tissues, the pollutants have the ability to biomagnify, or increase in concentration, as the compound is transferred through the food chain. These fish include fatty fish, such as carp, catfish, buffalo, drum, suckers and paddlefish.

2.2 TMDL Endpoint:

Action level for Chlordane in fish tissue as established by the U.S. Food and Drug Administration (FDA), is 0.3 milligrams per kilogram (mg/kg) or parts per million (ppm). The FDA set a 2.0 mg/kg limit on interstate shipment of fish for human consumption. The United States Environmental Protection Agency (U.S. EPA) sets a human health screening level of 0.01 mg/kg on PCBs in fish (MDNR, 2004 and U.S. EPA, 2004).

Based on water quality criterion specified by FDA and EPA, the endpoint delineating sufficient water quality to fully support the designated use will be average fish tissue concentrations below 0.3 mg/kg for Chlordane and 0.01 mg/kg for PCBs, respectively. These endpoints will lead to the removal of fish consumption advisories.

3. Anti-degradation Policy

Missouri's WQS include EPA's "three-tiered" approach to anti-degradation and may be found at 10 CSR 20-7.031(2).

Tier 1 – Protects existing uses and provides the absolute floor of water quality for all waters of the United States (U.S.). Existing instream water uses are those uses that were attained on or after November 29, 1975, the date of EPA's first WQS regulation, or uses for which existing water quality is suitable unless prevented by physical problems such as substrate or flow.

Tier 2 – Protects the level of water quality necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water in waters that are currently of higher quality than required to support these uses. Before water quality in Tier 2 waters can be lowered, there must be an anti-degradation review consisting of: (1) a finding that it is necessary to accommodate important economical or social development in the area where the waters are located; (2) full satisfaction of all intergovernmental coordination and public participation provisions; and (3) assurance that the highest statutory and regulatory requirements for point sources and best management practices for non-point sources are achieved. Furthermore, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses.

Tier 3 – Protects the quality of outstanding national resources, such as waters of national and state parks, wildlife refuges and water of exceptional recreational or ecological significance. There may be no new or increased discharges to these waters and no new or increased discharges to tributaries of these waters that would result in lower water quality (with the exception of some limited activities that result in temporary and short-term changes in water quality).

4. Source Inventory and Assessment

4.1 Chlordane:

Chlordane has been identified as a pollutant of concern because it is a bio-accumulative pesticide that is carcinogenic and can cause both acute and chronic toxic effects. Its polycyclic chlorinated organic structure produces deleterious biological effects similar to those of DDT, PCBs and other related substances (MDE, 2000).

Chlordane is a manufactured chemical that was used as a pesticide in the U.S. from 1948 to 1988 (ATSDR, 1995). Since its introduction in the 1940s, Chlordane was used as a broad-spectrum pesticide for agricultural, home and commercial control of insects until it was withdrawn from the market in 1988. The original source of Chlordane was runoff, particularly from urban areas where widespread termite eradication occurred around homes in the 1970s and 1980s. Chlordane was also used at nurseries, on golf courses and in agriculture. Chlordane was banned for agricultural use in 1975 and for all uses in 1988; therefore, no additional loading should occur. Some of its trade names include

Oktachlor and Velsicol 1068 (ATSDR, 1995). At the height of production, Chlordane was the second most widely used organochlorine insecticide in the U.S., with annual production of about 11 million kg/year. Production in the U.S. in 1974 amounted to 9.5 million kg (IPCS, 1988). Over 70,000 tons of Chlordane has been manufactured since 1946 (U.S. EPA, 1998).

As previously mentioned, Chlordane degrades very slowly, and thus is extremely persistent in the environment (with the ability to stay in the soil for over 20 years). Chlordane is not soluble and is not found in the water column of water bodies. Instead it attaches to soil and through erosion, moves into a water body and accumulates in lakebed or streambed sediments. It bio-accumulates in fish tissue and bottom-feeding fish (such as carp) which become exposed to Chlordane due to their feeding or dwelling preferences near Chlordane-contaminated sediments. Eating fish contaminated by Chlordane will not make a person immediately ill. However, over a long period of time, Chlordane may damage the nervous system, digestive system and the liver (MDNR, 2001).

4.2 Polychlorinated Biphenyls (PCBs):

PCBs are a mixture of up to 200 different chlorinated compounds and are stable under conditions of high pressure and high temperature. PCBs are manmade compounds that have been used commercially since 1929. These chemicals were manufactured as combinations of chlorinated biphenyls that differed according to the percentage of chlorine in the mixture. PCBs had a wide variety of industrial applications due to their chemical stability and flame resistance. However, these characteristics also enabled them to remain highly persistent in the environment. PCBs were commonly used as plasticizers, heat-transfer fluids, solvent extenders, hydraulic fluids, flame retardants, sealers, ink carriers, organic diluents and dielectric fluids. U.S. production of PCBs ended in 1977 due to concerns about the persistence of PCBs in the environment.

U.S. industry purchased approximately 1.25 billion pounds of PCBs by the time production stopped in 1977 (U.S. EPA, 1993). EPA estimates that 60 percent, or 750 million pounds, of PCBs produced are still in use in the U.S. in approximately 150,000 PCB transformers and 2.5 million mineral oil transformers (Graham, 1987). Another 36 percent (450 million pounds) of PCBs were either placed in landfills or dumps or were available to biota via air, water, soil and sediments. The remaining four percent (55 million pounds) were destroyed by incineration or were degraded in the environment (U.S. EPA, 1993). Monsanto Chemical Company in Sauget, Illinois produced approximately 99 percent of commercial PCBs for U.S. industry and sold the compounds under the trade name Aroclor (ATSDR, 1995a). A four digit numbering code identifies the Aroclors. The first two digits denote the number of carbon atoms in the biphenyl group and the last two digits represent the approximate percentage of chlorine in the mixture. The most common PCBs manufactured include Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260 (Cairns et. al., 1986).

Poorly maintained hazardous waste sites that contain PCBs, industrial and municipal incinerators burning organic wastes and illegal or improper dumping of PCB wastes such as transformer fluids and leaks or releases from electrical transformers release PCBs into the environment. The behavior of PCBs differs depending on the number of chlorine

atoms present. Generally, these compounds are relatively insoluble and have the ability to absorb strongly into organic matter. As the chlorine content increases, the solubility of the compounds decrease and the mixture becomes more viscous. PCBs are highly lipophilic (fat loving) and bio-accumulate in fish tissue, which can result in very high concentrations that are unsafe for human consumption (U.S. EPA, 1980). Currently, the primary source of PCB ingestion is through the consumption of contaminated fish (USDHHS, 1995). Fish uptake of PCBs in water through their gills and through the consumption of contaminated aquatic organisms. As with Chlordane, PCBs are absorbed into the bloodstream and accumulate primarily in fatty tissues. In these fatty tissues, they have the ability to biomagnify or increase in concentration, as the compound is transferred through the food chain. In humans and other mammals, PCBs accumulate in the gastrointestinal tract, adipose (fatty) tissue and skin.

The manufacturing of PCBs stopped in the U.S. in 1977 because of evidence that they accumulate in the environment which can cause harmful health effects.

5. Determination of TMDL and Allocation[3]

The following equation was used to calculate the TMDL.

TMDL = WLA + LA + MOS (Eq. 1)

where:

TMDL: Total Maximum Daily Load
WLA: Waste Load Allocation (for point sources)
LA: Load Allocation (for non-point sources)
MOS: Margin of Safety (to account for uncertainties)

TMDL/Loading Capacity:

TMDL or loading capacity is defined as the maximum pollutant load that a water body can assimilate and still attain WQS. EPA banned the use of Chlordane in 1988, so no additional Chlordane is being introduced into the environment (MDNR, 2001). Therefore, the TMDL for Chlordane in the 533 mile impaired segment along the Missouri River is set as zero pounds/day.

Similarly, EPA banned the use of PCBs in 1977, so no additional loading of PCBs should occur. Therefore, the TMDL for PCBs in the 533 mile impaired segment along the Missouri River is set as zero pounds/day.

WLA: Since Chlordane and PCBs were banned in 1988 and 1977, respectively, there will be no discharge of Chlordane and PCBs into streams from wastewater treatment plants and other point sources. Therefore, the WLA is set as zero pounds/day in this TMDL.

LA: Since Chlordane and PCBs were banned, there will be no application of Chlordane anywhere it might be discharged under runoff conditions and enter the stream. Therefore, the LA is set as zero pounds/day in this TMDL.

[3] Calculations and graphs by Parsons Corporation, a Pasadena-based engineering and construction firm

MOS: In order to ensure there is no threat of Chlordane and PCB levels impairing fish consumption, fish advisories will remain in effect until all samples taken from fish have met the desired endpoint for three consecutive years.

Seasonal Variation: There is no seasonal variation associated with this TMDL.

6. Implementation

Since Chlordane and PCBs have been banned, there is no specific remediation plan for this impairment. Fish tissue concentrations are declining as Chlordane and PCBs are purged or degraded in water body sediments over time. Figures 3 and 4 show the average annual Chlordane and PCB concentrations and their corresponding moving average trends.

Figure 3: Average Annual Chlordane Concentration and Three-Year Moving Average in Missouri River over Time

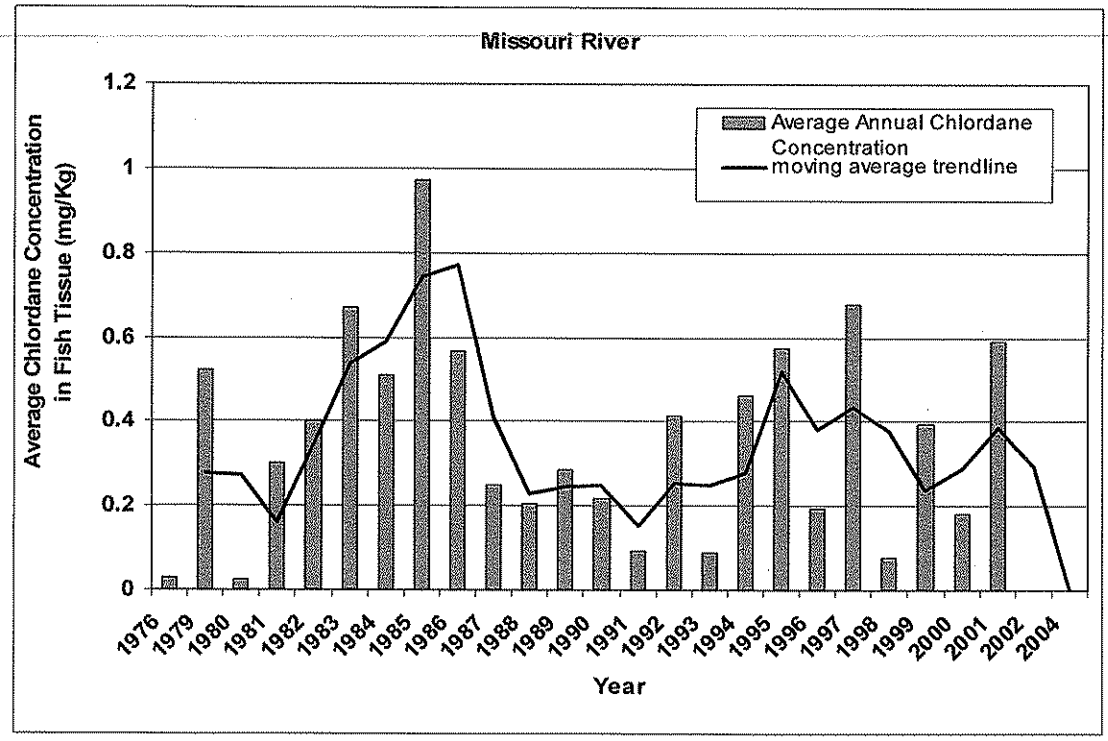
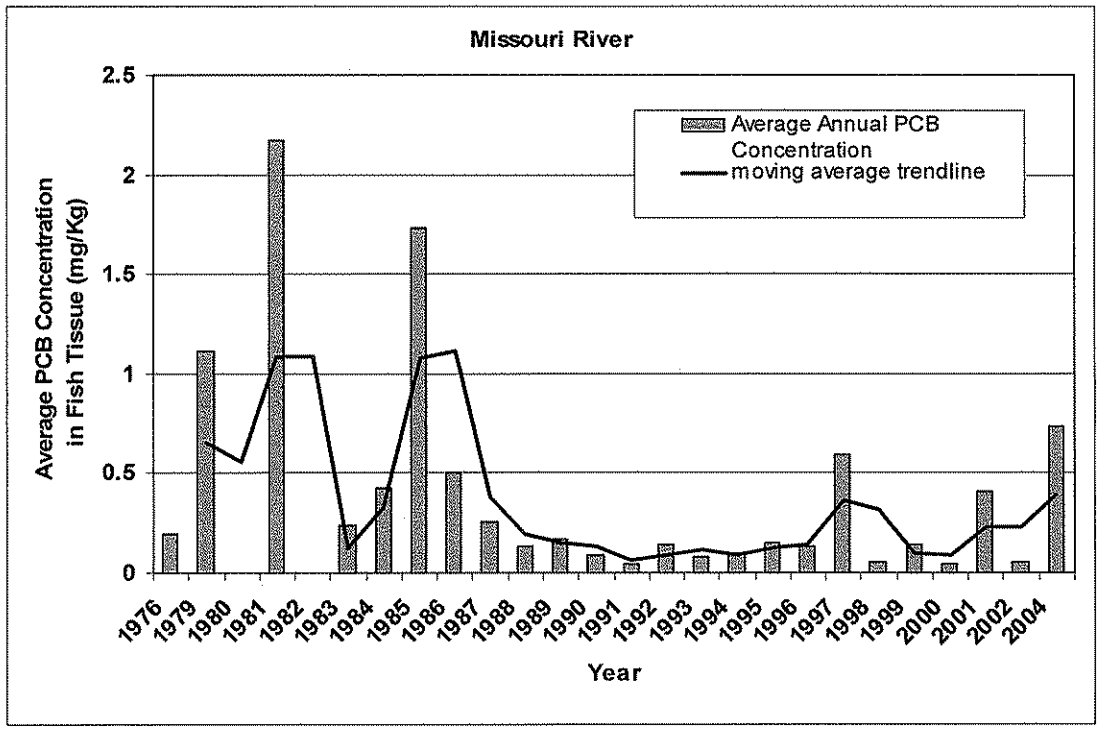


Figure 4: Average Annual PCB Concentration and Three-Year Moving Average in Missouri River over Time



The department recognizes that data collected to date does not always reflect a downward trend of PCBs or Chlordane on a year-to-year basis, however, that this is most likely due to collection inconsistencies. Some years of data contain tissue samples of many different fish species, but some years contain only one or two species of fish. Fatty fish, such as carp, tend to absorb more PCBs than a less fatty fish such as catfish. Likewise, feeding habits, rainfall and age and size of the fish can effect the amount of sediment (thus PCBs and Chlordane) assimilated by fish or the bio-accumulative effect. The most recent data predominately sampled catfish and sturgeon, however in 2004, only sturgeon was sampled. This would tend to show increasing levels of PCBs and Chlordane in later years and obscure the overall downward trend.

As mentioned, these pollutants degrade slowly and are extremely persistent in the environment. However, since they are no longer produced, a downward trend is inevitable and this TMDL recommends development of a consistent protocol for measurement of the pollutants in fish tissue and continued sampling.

This is a phased TMDL, which means that if future data indicates fish tissue Chlordane and PCB levels are not continuing to decline, this TMDL will be re-evaluated. This TMDL will be incorporated into Missouri's Water Quality Management Plan.

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Appendix

Table A: Sampling Locations along Missouri River

Table B: Missouri River Fish Tissue Data

Table A: Sampling Locations along Missouri River

Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
1	Missouri River	Rulo, Nebraska	RM 498	40.0394	-95.4144	NDEQ
2	Missouri River	below Nodaway River, Missouri	RM 462.6	39.9003	-94.96022	MDC
3	Missouri River	Nodaway Island Access, Missouri	RM 462.1	39.9013	-94.9531	MDC
4	Missouri River	St. Joseph, Missouri	RM 448.2	39.754	-94.858	EPA/MDNR USEPA MDC
5	Missouri River	Leavenworth, Kansas	RM 397	39.3291	-94.9085	USEPA MDC USGS
6	Missouri River	Kansas City, Missouri	RM 365.8	39.1194	-94.534	EPA/MDNR USEPA MDC USGS
7	Missouri River	below I-635, Missouri	RM 374	39.1531	-94.6495	USEPA MDC
8	Missouri River	below US 169, Missouri	RM 365.9	39.113	-94.586	USEPA
9	Missouri River	above Hwy 269, Missouri	RM 363	39.1387	-94.5424	USEPA
10	Missouri River	above I-435, Missouri	RM 361	39.1515	-94.5117	USEPA
11	Missouri River	below Blue Ridge Blvd., Missouri	RM 358	39.1291	-94.4686	USEPA EPA/MDNR MDC
12	Missouri River	near Shoal Creek, Missouri	RM 351.8	39.168	-94.3723	USEPA MDC
13	Missouri River	Napolean, Missouri	RM 329.2	39.1342	-94.0645	MDC
14	Missouri River	Lexington, Missouri	RM 317.3	39.1869	-93.8965	EPA/MDNR USEPA MDC
15	Missouri River	near Malta Bend, Missouri	RM 275.3	39.2382	-93.3614	MDC
16	Missouri River	Miami, Missouri	RM 262.7	39.3289	-93.2252	MDC
17	Missouri River	Glasgow, Missouri	RM 226.5	39.2223	-92.8505	MDC
19	Missouri River	Boonville, Missouri	RM 196.7	38.9812	-92.7456	MDC

Table A: Sampling Locations along Missouri River

Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
19	Missouri	near Columbia,	RM 185	38.9597	-92.545	EPA/MDNR
20	Missouri River	Jefferson City, Missouri	RM 143.2	38.5875	-92.1788	USEPA MDC
21	Missouri River	Mokane, Missouri	RM 123.4	38.6519	-91.8831	MDC
22	Missouri River	Hermann, Missouri	RM 97.9	38.71	-91.4391022	EPA/MDNR MDC USGS
23	Missouri River	Weldon Springs CA, Missouri	RM 44.1	38.6565	-90.7332	MDC
24	Missouri River	Chesterfield, Missouri	RM 39	38.6874	-90.6627	USPHS MDC
25	Missouri River	St. Charles, Missouri	RM 28.2	38.7984	-90.4662	MDC

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
USEPA	356	U*	MO R. KC	B CRA		1976	1	ND	ND
USEPA			MO R. YANKTON	BL SUC		1976	2	ND	.127
USEPA	356	U*	MO R. KC	BUF		1976	2	.032	.121
USEPA	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1976	1	ND	.120
USEPA	356	U*	MO R. KC	CARP		1976	1	.042	.344
USEPA			MO R. PLATTSMOUTH	CARP		1976	4	.019	.124
USEPA			MO R. SIOUX CITY	CARP		1976		ND	.149
USEPA	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARPSU	BUCHANAN	1976	3	ND	.166
USEPA			MO R. PLATTSMOUTH	CARPSU		1976	4	ND	ND
USEPA			MO R. SIOUX CITY	CARPSU		1976	4	ND	.136
USEPA			MO R. YANKTON	CARPSU		1976	2	ND	.078
MDC	701	701/92.2	Missouri R. @ Boonville	CAT	COOPER	1976	6	.274	.810
USEPA			MO R. YANKTON	DRUM		1976	1	.091	.134
USEPA	701	701/39.5	Missouri R. @ Jefferson City	FH CAT	COLE	1976	1	ND	ND
USEPA			MO R. PLATTSMOUTH	FH CAT		1976	4	ND	.091
USEPA			MO R. SIOUX CITY	FH CAT		1976	2	ND	.127
USEPA			MO R. YANKTON	FH CAT		1976	2	ND	ND
USEPA	701	701/39.5	Missouri R. @ Jefferson City	G EYE	COLE	1976	1	.080	.448
USEPA	226	226/80.5	Missouri R.@St. Joseph, Mo.	G EYE	BUCHANAN	1976	4	.189	.281
USEPA			MO R. PLATTSMOUTH	G EYE		1976	4	.010	.191
USEPA			MO R. SIOUX CITY	G EYE		1976	4	ND	.103
USEPA			MO R. YANKTON	G EYE		1976	1	ND	.167
USEPA	356	U*	MO R. KC	G SHAD		1976	3	.037	.751

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
USEPA			MO R. YANKTON	GAR		1976	1	ND	ND
USEPA	701	701/39.5	Missouri R. @ Jefferson City	MIXED	COLE	1976		.017	.462
USEPA	701	701/39.5	Missouri R. @ Jefferson City	N RED	COLE	1976	1	.039	.161
USEPA			MO R. PLATTSMOUTH	N RED		1976	1	ND	.063
USEPA			MO R. SIOUX CITY	N RED		1976	3	.016	ND
USEPA			MO R. YANKTON	N RED		1976	3	ND	ND
USEPA	226	226/80.5	Missouri R.@St. Joseph, Mo.	S GAR	BUCHANAN	1976	1	.023	.086
USEPA			MO R. SIOUX CITY	SHAD		1976	1	ND	.287
USEPA			MO R. YANKTON	SHAD		1976	3	.095	.370
USEPA			MO R. PLATTSMOUTH	SM BUF		1976	1	.029	.136
USEPA			MO R. SIOUX CITY	SM BUF		1976	4	.077	.836
USEPA			MO R. YANKTON	SM BUF		1976	2	ND	.076
USEPA			MO R. YANKTON	STRIPE		1976	2	ND	ND
USEPA			MO R. SIOUX CITY	WALL		1976	1	.012	.140
USGS	226	R**	MO R. NEBRASKAC	CARP		1979	1	.140	.500
USGS	226	R**	MO R. NEBRASKAC	CARP		1979	1	.120	.400
USGS	1604	1604/97.9	Missouri R. @ Hermann	CARPSU	GASCONADE	1979	1	.900	1.700
USGS	1604	1604/97.9	Missouri R. @ Hermann	CARPSU	GASCONADE	1979	1	.680	2.200
USGS	226	R**	MO R. NEBRASKAC	G EYE		1979	1	.550	1.000
USGS	1604	1604/97.9	Missouri R. @ Hermann	SM BUF	GASCONADE	1979	1	.740	.900
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	B BUF	GASCONADE	1980	5	0.026	ND

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1980	5	.022	ND
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1981	5	ND	ND
USEPA	226	226/30.1	Missouri R. @ Leavenworth , KS	CARP	PLATTE	1981	5	.300	ND
USEPA	356	356/77.4	Missouri R. @ Lexington	CARP	LAFAYETTE	1981	5	.310	ND
USEPA	356	356/77.4	Missouri R. @ Lexington	CARP	LAFAYETTE	1981	3	ND	ND
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1981	5	ND	ND
EPA/MDNR	356	U*	MO R. KC	CARP		1981	5	ND	ND
USEPA	356	U*	MO R. KC	CARP		1981	6	1.720	22.300
USEPA	356	U*	MO R. KC	CARP		1981	5	.210	ND
USGS	226	R**	MO R. NEBRASKA C	CARP		1981	1	.230	.400
USGS	226	R**	MO R. NEBRASKA C	CARP		1981	1	.150	.400
USGS	226	R**	MO R. NEBRASKA C	G EYE		1981	1	.370	.800
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	B BUF	GASCONADE	1982	5	.670	ND
NDEQ	226	226/NE	Missouri R. nr. Winnebago, NE	CARP		1982	4	.104	
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1982	5	.730	ND
EPA/IADNR			MO R. SIOUX CITY	CARP		1982	4	.104	
USEPA	226	226/30.1	Missouri R. @ Leavenworth , KS		PLATTE	1983		2.350	
USEPA	226	226/80.5	Missouri R.@St. Joseph, Mo.		BUCHANAN	1983		.872	
USEPA	226	R**	MO R. NEBRASKA C			1983		.856	
USEPA			MO R. OMAHA			1983		TR	

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
USEPA			MO R. PLATTSMOUTH			1983		TR	
USEPA			MO R. PLATTSMOUTH			1983		TR	
USEPA			MO R. PLATTSMOUTH			1983		.280	
USEPA			MO R. SIOUX CITY			1983		TR	
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1983	3	.570	.240
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1983	5	.410	ND
EPA/MDNR	356	U*	MO R. KC	CARP		1983	6	2.700	ND
EPA/IADNR			MO R. SIOUX CITY	MIXED		1983	5	ND	
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1984	1	.230	.054
EPA/MDNR	356	356/77.4	Missouri R. @ Lexington	CARP	LAFAYETTE	1984	5	.420	ND
EPA/MDNR	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1984	14	.180	.058
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1984	7	TR	ND
EPA/MDNR	356	U*	MO R. KC	CARP		1984	5	4.500	2.110
EPA/MDNR	226	R**	MO R. NEBRASKA C	CARP		1984	6	.160	ND
USEPA			MO R. OMAHA	CARP		1984	6	.150	.083
USEPA			MO R. PLATTSMOUTH	CARP		1984	4	.280	.230
EPA/IADNR			MO R. SIOUX CITY	CARP		1984	5	TR	
EPA/MDNR	701	701/80.7	Missouri R. nr. Columbia	CARPSU	BOONE	1984	20	.145	.254
EPA/MDNR	701	701/80.7	Missouri R. nr. Columbia	CH CAT	BOONE	1984	20	.205	.077
EPA/MDNR	701	701/80.7	Missouri R. nr. Columbia	FH CAT	BOONE	1984	20	.160	.095
EPA/MDNR	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1984	20	.199	2.520
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1985	3	.600	.285
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1985	3	.190	.159
EPA/MDNR	356	356/77.4	Missouri R. @ Lexington	CARP	LAFAYETTE	1985	5	.670	ND

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
EPA/MDNR	356	356/77.4	Missouri R. @ Lexington	CARP	LAFAYETTE	1985	5	.920	.530
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1985	5	.54	.21
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1985	5	.26	.043
EPA/MDNR	356	U*	MO R. KC	CARP		1985	4	2.300	5.110
EPA/MDNR	356	U*	MO R. KC	CARP		1985	3	2.300	7.490
MDC	701	701/80.7	Missouri R. nr. Columbia	BUF	BOONE	1986		.423	LT .150
USPHS	1604	1604/43.9	Missouri R. @ Chesterfield	CARP	ST LOUIS	1986			
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1986	6	.210	LT .150
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CARP		1986	5		
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1986	5	.4	.085
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1986	5	.18	.26
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1986	5	.11	
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1986	5		
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1986		.118	LT .150
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1986	5	.220	LT .260
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1986	5	.240	LT .260
MDC	356	U*	MO R. KC	CARP		1986	5	.548	
EPA/MDNR	356	U*	MO R. KC	CARP		1986	5	2.700	2.165
EPA/MDNR	356	U*	MO R. KC	CARP		1986	5	2.000	1.225
EPA/MDNR			MO R. OMAHA	CARP		1986	5	.400	.160
EPA/MDNR			MO R. OMAHA	CARP		1986	5	.180	.390
MDC	701	701/80.7	Missouri R. nr. Columbia	CARPSU	BOONE	1986		.961	.356
USPHS	1604	1604/43.9	Missouri R. @ Chesterfield	CH CAT	ST LOUIS	1986			

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	701	701/80.7	Missouri R. nr. Columbia	CH CAT	BOONE	1986		.518	LT .150
MDC	356	U*	MO R. KC	CH CAT		1986	5	.777	
EPA/MDNR			MO R. SIOUX CITY	CH CAT		1986	5	.074	LT .170
USPHS	1604	1604/43.9	Missouri R. @ Chesterfield	DRUM	ST LOUIS	1986			
MDC	701	701/80.7	Missouri R. nr. Columbia	DRUM	BOONE	1986		.139	.123
USPHS	1604	1604/43.9	Missouri R. @ Chesterfield	FH CAT	ST LOUIS	1986			
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	FH CAT		1986	7		
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	N PIKE		1986	1		
USPHS	1604	1604/43.9	Missouri R. @ Chesterfield	SHSTUR	ST LOUIS	1986			
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		.821	.493
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		.295	.316
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		.999	.578
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		1.609	1.265
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		.577	.551
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		1.530	1.807
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		1.770	2.363
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		1.299	1.131
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		LT .005	1.512
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1986		LT .005	1.039
MDC	701	701/80.7	Missouri R. nr. Columbia	W BASS	BOONE	1986		.124	LT .150
MDC	1604	1604/43.9	Missouri R. @ Chesterfield	BL CAT	ST LOUIS	1987	3	.028	.121
MDC	1604	1604/43.9	Missouri R. @ Chesterfield	BM BUF	ST LOUIS	1987	5	.110	LT .050
MDC	356	U*	MO R. KC	BM BUF		1987	5	.995	LT .050

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	226	R**	MO R. NEBRASKA C	BM BUF		1987	1	.021	LT .050
MDC	701	701/92.2	Missouri R. @ Boonville	CARP	COOPER	1987	1	.157	.090
MDC	701	701/92.2	Missouri R. @ Boonville	CARP	COOPER	1987	5	.473	.093
MDC	701	701/92.2	Missouri R. @ Boonville	CARP	COOPER	1987	5	.177	.070
MDC	1604	1604/43.9	Missouri R. @ Chesterfield	CARP	ST LOUIS	1987	5	.081	LT .050
MDC	1604	1604/43.9	Missouri R. @ Chesterfield	CARP	ST LOUIS	1987	5	.066	LT .050
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1987	2	.103	.122
MDC	226	226/30.1	Missouri R. @ Leavenworth , KS	CARP	PLATTE	1987	1	.095	LT .050
MDC	226	226/30.1	Missouri R. @ Leavenworth , KS	CARP	PLATTE	1987	4	.114	.036
MDC	226	226/30.1	Missouri R. @ Leavenworth , KS	CARP	PLATTE	1987	5	.115	LT .050
MDC	226	226/30.1	Missouri R. @ Leavenworth , KS	CARP	PLATTE	1987	5	.059	LT .050
MDC	226	226/30.1	Missouri R. @ Leavenworth , KS	CARP	PLATTE	1987	5	.077	LT .050
MDC	356	356/77.4	Missouri R. @ Lexington	CARP	LAFAYETTE	1987	5	.132	.139
USEPA	356	356/124.2	Missouri R. ab. Hwy. 269	CARP	JACKSON	1987	3	.100	.540
USEPA	356	356/124.2	Missouri R. ab. Hwy. 269	CARP	JACKSON	1987	3	.788	.640
USEPA	356	356/122.2	Missouri R. ab. I-435	CARP	JACKSON	1987	3	.086	.425
USEPA	356	356/122.2	Missouri R. ab. I-435	CARP	JACKSON	1987	3	.217	.702
USEPA	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1987	3		1.260
USEPA	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1987	3		3.220
USEPA	226	226/6.7	Missouri R. bl. I-635	CARP	PLATTE	1987	3	.265	.630

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
USEPA	226	226/6.7	Missouri R. bl. I-635	CARP	PLATTE	1987	3	.258	.630
USEPA	356	356/127.2	Missouri R. bl. US 169	CARP	JACKSON	1987	4	.264	.673
USEPA	356	356/127.2	Missouri R. bl. US 169	CARP	JACKSON	1987	5	.170	.395
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1987	5	1.1	ND
NDEQ		226/NE	Missouri R. nr. Bellevue, NE	CARP		1987	5	.24	ND
USEPA	356	356/112.7	Missouri R. nr. Shoal Cr.	CARP	CLAY	1987	3	.152	.215
USEPA	356	356/112.7	Missouri R. nr. Shoal Cr.	CARP	CLAY	1987	3	.161	.225
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1987	4	.169	.180
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1987	4	.246	.279
EPA/MDNR	356	U*	MO R. KC	CARP		1987	3	.750	3.000
EPA/MDNR	356	U*	MO R. KC	CARP		1987	3	.494	1.335
MDC	356	U*	MO R. KC	CARP		1987	5	.171	.053
MDC	356	U*	MO R. KC	CARP		1987	5	.087	.095
MDC	356	U*	MO R. KC	CARP		1987	5	.201	.079
MDC	226	R**	MO R. NEBRASKA C	CARP		1987	5	.036	LT .050
MDC	701	701/92.2	Missouri R. @ Boonville	CARPSU	COOPER	1987	5	.634	.068
MDC	356	U*	MO R. KC	CARPSU		1987	5	.327	.092
MDC	701	701/92.2	Missouri R. @ Boonville	CH CAT	COOPER	1987	1	1.346	.245
MDC	701	701/92.2	Missouri R. @ Boonville	CH CAT	COOPER	1987	5	.249	.071
R	701	701/92.2	Missouri R. @ Boonville	CH CAT	COOPER	1987	5	.874	.092
MDC	701	701/92.2	Missouri R. @ Boonville	CH CAT	COOPER	1987	5	.295	.205

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	1604	1604/43.9	Missouri R. @ Chesterfield	CH CAT	ST LOUIS	1987	3	.045	.081
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	CH CAT	PLATTE	1987	3	.181	.121
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	CH CAT	PLATTE	1987	5	.087	LT .050
MDC	356	356/77.4	Missouri R. @ Lexington	CH CAT	LAFAYETTE	1987	5	.085	LT .050
MDC	356	U*	MO R. KC	CH CAT		1987	3	1.050	LT .050
MDC	356	U*	MO R. KC	CH CAT		1987	4	.402	.092
MDC	356	U*	MO R. KC	CH CAT		1987	4	.133	LT .050
MDC	701	701/92.2	Missouri R. @ Boonville	DRUM	COOPER	1987	5	.073	.019
MDC	356	U*	MO R. KC	DRUM		1987	5	.130	LT .050
MDC	226	R**	MO R. NEBRASKA C	DRUM		1987	2	.035	LT .050
MDC	701	701/92.2	Missouri R. @ Boonville	FH CAT	COOPER	1987	1	1.063	.274
MDC	701	701/92.2	Missouri R. @ Boonville	FH CAT	COOPER	1987	5	.276	.090
MDC	1604	1604/43.9	Missouri R. @ Chesterfield	FH CAT	ST LOUIS	1987	3	.029	LT .050
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	FH CAT	PLATTE	1987	4	.066	.121
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	FH CAT	PLATTE	1987	5	.043	.053
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	FH CAT	PLATTE	1987	5	.031	LT .050
MDC	356	356/77.4	Missouri R. @ Lexington	FH CAT	LAFAYETTE	1987	5	.095	.055
MDC	356	U*	MO R. KC	FH CAT		1987	3	.038	LT .050

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	356	U*	MO R. KC	FH CAT		1987	4	.057	LT .050
MDC	226	R**	MO R. NEBRASKA C	FH CAT		1987	2	.140	LT .050
MDC	226	R**	MO R. NEBRASKA C	SAUGER		1987	1	.022	LT .050
MDC	701	701/92.2	Missouri R. @ Boonville	SHSTUR	COOPER	1987	6	.749	.303
MDC	356	U*	MO R. KC	SHSTUR		1987	1	.017	.170
MDC	356	356/77.4	Missouri R. @ Lexington	SM BUF	LAFAYETTE	1987	1	.042	LT .050
MDC	356	U*	MO R. KC	SM BUF		1987	5	.118	LT .050
MDC	226	R**	MO R. NEBRASKA C	SM BUF		1987	1	.027	LT .050
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	BUF		1988	4	.15	.12
USGS	226	226/30.1	Missouri R. @ Leavenworth, KS	CARP	PLATTE	1988	5	.360	.030
NDEQ		226/NE	Missouri R. @ Rulo, NE	CARP		1988	5	.13	ND
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1988	4	.415	.088
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CARP		1988	3	0.26	.021
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	CARP		1988	5	.061	ND
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1988	5	.189	.155
USGS			MO R. DAKOTA CITY	CARP		1988	5	.180	.060
USGS	356	U*	MO R. KC	CARP		1988	5	1.230	.550
USGS	226	R**	MO R. NEBRASKA C	CARP		1988	5	.030	
USGS			MO R. YANKTON	CARP		1988	5	.180	.030

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CH CAT	GASCONADE	1988	4	.187	.310
USGS	226	226/30.1	Missouri R. @ Leavenworth, KS	CH CAT	PLATTE	1988	3	.480	.300
NDEQ	226	226/NE	Missouri R. @ N end of Omaha, NE	CH CAT		1988	2	.22	.17
NDEQ	226	226/NE	Missouri R. @ N end of Omaha, NE	CH CAT		1988	3	.097	.074
NDEQ	226	226/NE	Missouri R. @ N end of Omaha, NE	CH CAT		1988	3	.07	ND
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1988	3	.22	.15
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1988	3	.18	.1
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1988	3	.15	.1
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1988	3	.086	ND
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1988	3	ND	.43
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1988	3	.14	.081
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1988	3	.1	ND
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1988	3	.17	.163
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1988	3	0.11	ND
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1988	2	0.11	ND
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1988	2	0.10	ND

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1988	3	0.21	.032
NDEQ	226	226/NE	Missouri R. nr. Blair, NE	CH CAT		1988	3	.049	ND
NDEQ	226	226/NE	Missouri R. nr. Blair, NE	CH CAT		1988	3	.069	.025
NDEQ	226	226/NE	Missouri R. nr. Blair, NE	CH CAT		1988	3	.051	ND
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	CH CAT		1988	3	.05	ND
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	CH CAT		1988	3	ND	ND
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	CH CAT		1988	3	ND	ND
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	CH CAT		1988	5	.11	.201
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1988	1	0.470	.051
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1988	2	0.460	.055
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1988	1	0.160	ND
USGS			MO R. DAKOTA CITY	CH CAT		1988	5	.060	.030
USGS	356	U*	MO R. KC	CH CAT		1988	5	.630	.330
USGS	226	R**	MO R. NEBRASKA C	CH CAT		1988	5	.270	
USGS			MO R. YANKTON	CH CAT		1988	5	.005	.030
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	DRUM		1988	5	.35	.59
USGS			MO R. DAKOTA CITY	DRUM		1988	5	.120	.130
USGS	356	U*	MO R. KC	DRUM		1988	5	.600	.620

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Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
USGS	226	R**	MO R. NEBRASKA C	DRUM		1988	3	.240	
USGS			MO R. YANKTON	DRUM		1988	5	.330	.380
USGS	226	226/30.1	Missouri R. @ Leavenworth , KS	G EYE	PLATTE	1988	5	.330	.720
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	G EYE		1988	5	0.15	.044
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	G EYE		1988	5	ND	.086
USGS			MO R. DAKOTA CITY	G EYE		1988	5	.310	.650
USGS	226	R**	MO R. NEBRASKA C	G EYE		1988	5	.005	
USGS			MO R. YANKTON	G EYE		1988	5	.060	.030
USGS	226	226/30.1	Missouri R. @ Leavenworth , KS	G SHAD	PLATTE	1988	5	.060	.030
NDEQ	226	226/NE	Missouri R. nr. Dakota City, NE	G SHAD		1988	3	.055	.041
USGS			MO R. DAKOTA CITY	G SHAD		1988	5	.060	.070
USGS	226	R**	MO R. NEBRASKA C	G SHAD		1988	5	.005	
USGS			MO R. YANKTON	G SHAD		1988	5	.005	.030
NDEQ	226	226/NE	Missouri R. nr. Blair, NE	PADDLE		1988	1	ND	ND
USGS	226	226/30.1	Missouri R. @ Leavenworth , KS	SHSTUR	PLATTE	1988	5	.990	.700
USGS			MO R. DAKOTA CITY	SHSTUR		1988	5	.180	.350

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
USGS	226	R**	MO R. NEBRASKA C	SHSTUR		1988	4	.750	
USGS			MO R. YANKTON	SHSTUR		1988	5	.210	.240
USGS			MO R. YANKTON	WALL		1988	5	.005	.030
MDC	701	701/92.2	Missouri R. @ Boonville	CARP	COOPER	1989	5	.449	.165
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1989	1	.240	.231
MDC	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1989	3	.153	.127
MDC	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1989	2	.152	.131
MDC	701	701/39.5	Missouri R. @ Jefferson City	CARP	COLE	1989	5	.298	.093
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	CARP	PLATTE	1989	5	.084	LT .050
MDC	1604	1604/28.0	Missouri R. @ St. Charles	CARP	ST CHARLES	1989	5	.210	.151
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1989	5	2.200	1.820
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1989	3	.095	LT .050
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1989	2	.213	.087
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	CARP	CLAY	1989	5	.366	.056
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CARP		1989	5	0.330	
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CARP		1989	5	0.390	
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CARP		1989	5	0.220	
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1989	4	.140	.167
MDC	226	R**	MO R. NEBRASKA C	CARP		1989	5	.140	LT .050
MDC	701	701/92.2	Missouri R. @ Boonville	CH CAT	COOPER	1989	5	.283	.111
MDC	1604	1604/97.9	Missouri R. @ Hermann	CH CAT	GASCONADE	1989	5	.393	.133

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Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	701	701/39.5	Missouri R. @ Jefferson City	CH CAT	COLE	1989	5	.253	.072
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	CH CAT	PLATTE	1989	5	.735	.173
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1989	3	.0097	
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1989	3	.15	
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1989	3	.64	
MDC	1604	1604/28.0	Missouri R. @ St. Charles	CH CAT	ST CHARLES	1989	3	.358	.161
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1989	3	0.13	
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1989	3	0.23	
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1989	3	0.12	
MDC	701	701/80.7	Missouri R. nr. Columbia	CH CAT	BOONE	1989	5	.141	LT .050
MDC	701	701/80.7	Missouri R. nr. Columbia	CH CAT	BOONE	1989	2	.100	LT .050
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	CH CAT	CLAY	1989	5	.410	.082
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1989	3	0.110	
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1989	3	0.085	
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1989	3	0.200	
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1989	3	0.270	
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1989	3	0.160	

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Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	226	R**	MO R. NEBRASKA C	CH CAT		1989	5	.144	LT .050
MDC	701	701/92.2	Missouri R. @ Boonville	FH CAT	COOPER	1989	3	.060	LT .050
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1989	5	.187	.078
MDC	701	701/92.2	Missouri R. @ Boonville	CARP	COOPER	1990	5	.251	.100
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1990	3	.340	.367
MDC	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1990	5	.228	.106
MDC	701	701/39.5	Missouri R. @ Jefferson City	CARP	COLE	1990	5	.063	LT .050
MDC	226	226/6.7	Missouri R. bl. I-635	CARP	PLATTE	1990	5	.107	LT .050
MDC	356	356/36.4	Missouri R. nr. Malta Bend	CARP	SALINE	1990	5	.234	.091
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	CARP	CLAY	1990	5	.534	.124
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1990	5	.410	.355
MDC	701	701/92.2	Missouri R. @ Boonville	CH CAT	COOPER	1990	5	.162	LT .050
MDC	1604	1604/97.9	Missouri R. @ Hermann	CH CAT	GASCONADE	1990	5	.347	.192
MDC	701	701/39.5	Missouri R. @ Jefferson City	CH CAT	COLE	1990	5	.204	.084
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	CH CAT	CLAY	1990	5	.547	.079
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1990	5	0.083	ND
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1990	5	0.034	ND
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1990	5	0.160	.044
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1990	5	0.071	ND
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1990	5	0.064	ND
MDC	226	R**	MO R. NEBRASKA C	CH CAT		1990	5	.109	LT .050

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Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	226	226/6.7	Missouri R. bl. I-635	FH CAT	PLATTE	1990	5	.106	LT .050
MDC	1604	1604/97.9	Missouri R. @ Hermann	PADDLE	GASCONADE	1990	1	.105	LT .050
MDC	1604	1604/97.9	Missouri R. @ Hermann	PADDLE	GASCONADE	1990	1	.111	LT .050
MDC	1604	1604/97.9	Missouri R. @ Hermann	SHSTUR	GASCONADE	1990	5	.455	.285
MDC	701	701/121.9	Missouri R. @ Glasgow	CARP	HOWARD	1991		.140	LT .050
MDC	701	701/39.5	Missouri R. @ Jefferson City	CARP	COLE	1991		.034	LT .050
MDC	226	226/30.1	Missouri R. @ Leavenworth, KS	CARP	PLATTE	1991		.135	LT .050
MDC	1604	1604/28.0	Missouri R. @ St. Charles	CARP	ST CHARLES	1991		.233	.057
MDC	1604	1604/68.4	Missouri R. @ Washington	CARP	FRANKLIN	1991		LT .020	LT .050
MDC	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1991		.302	.125
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1991		.073	LT .050
MDC	226	R**	MO R. NEBRASKA C	CARP		1991		.041	LT .050
MDC	701	701/121.9	Missouri R. @ Glasgow	CH CAT	HOWARD	1991		.090	LT .050
MDC	701	701/39.5	Missouri R. @ Jefferson City	CH CAT	COLE	1991		.113	LT .050
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1991	5	.066	ND
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1991	5	.14	ND
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1991	5		.059
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1991	5	.11	.06
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1991	5	.097	.04

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Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1991	5	.061	.118
MDC	1604	1604/28.0	Missouri R. @ St. Charles	CH CAT	ST CHARLES	1991		.141	.086
MDC	1604	1604/28.0	Missouri R. @ St. Charles	CH CAT	ST CHARLES	1991		.121	.149
MDC	1604	1604/68.4	Missouri R. @ Washington	CH CAT	FRANKLIN	1991		LT .020	LT .050
MDC	356	356/119.2	Missouri R. bl. Blue R.	CH CAT	CLAY	1991		.029	LT .050
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1991	5	0.087	.049
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1991	5	0.098	.052
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1991	5	0.077	.022
MDC	701	701/80.7	Missouri R. nr. Columbia	CH CAT	BOONE	1991		.108	LT .050
MDC	226	R**	MO R. NEBRASKA C	CH CAT		1991		.027	LT .050
MDC	226	R**	MO R. NEBRASKA C	BL CAT		1992	1	.412	.248
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	CARP	CLAY	1992	1	.212	.076
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1992		.210	.240
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CH CAT	GASCONADE	1992		.330	.160
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1992	3		
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1992	4		
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1992	4		
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1992	4		

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1992	3		.055
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1992	3		.17
NDEQ	226	226/NE	Missouri R. @ S end of Omaha, NE	CH CAT		1992	3		
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1992	4		.137
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1992	4		.103
NDEQ		226/NE	Missouri R. NE of Plattsmouth, NE	CH CAT		1992	4		.131
EPA/MDNR	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1993	2	LT .060	LT .100
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1993	3	.230	.230
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1993	3	.04	.045
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1993	3	.053	.05
NDEQ		226/NE	Missouri R. @ Nebraska City, NE	CH CAT		1993	3	.083	.039
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	CARP	CLAY	1994	18	.092	LT .050
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	CARP	CLAY	1994	18	.835	.161
USGS-BEST	1604	1604/97.9	Missouri R. @ Hermann	BASS	GASCONADE	1995	17		LT .1
USGS-BEST	1604	1604/97.9	Missouri R. @ Hermann	CARP	GASCONADE	1995	15		.3
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1995	5	1.200	.443
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1995	5	.210	.079
USGS-BEST			MO R. NEBRASKA C	CARP		1995	23		LT 0.1

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1995	4	0.310	ND
MDC	701	701/80.7	Missouri R. nr. Columbia	BUF	BOONE	1996	15	.192	.131
MDC	701	701/80.7	Missouri R. nr. Columbia	BUF	BOONE	1996	10	.171	LT .050
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	BUF	BUCHANAN	1996	11	.151	LT .050
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	BUF	BUCHANAN	1996	6	.199	.102
MDC	1604	1604/28.0	Missouri R. @ St. Charles	CARP	ST CHARLES	1996	23	.175	.112
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1996	17	.138	.084
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1996	14	.158	.079
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1996	14	.166	.074
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1996	28	.087	LT .050
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1996	17	.046	LT .050
NDEQ		226/NE	Missouri R. @ Rulo, NE	CH CAT		1996	5	.084	.093
MDC	1604	1604/28.0	Missouri R. @ St. Charles	CH CAT	ST CHARLES	1996	24	.164	.065
MDC	701	701/80.7	Missouri R. nr. Columbia	CH CAT	BOONE	1996	25	.180	.059
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		1996	4	0.085	ND
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	CH CAT	BUCHANAN	1996	25	.048	LT .050
MDC	1604	1604/28.0	Missouri R. @ St. Charles	SHSTUR	ST CHARLES	1996	13	.278	LT .050
MDC	1604	1604/28.0	Missouri R. @ St. Charles	SHSTUR	ST CHARLES	1996		.320	LT .050
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1996	25	.032	.230
MDC	701	701/80.7	Missouri R. nr. Columbia	SHSTUR	BOONE	1996	5	.247	.354

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	SHSTUR	BUCHANAN	1996	7	.128	.183
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	SHSTUR	BUCHANAN	1996	13	.090	.099
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	SHSTUR	BUCHANAN	1996		.541	.586
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	SHSTUR	BUCHANAN	1996		.726	.698
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1997	4	1.600	1.560
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1997	3	1.500	1.260
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1997	25	.104	LT .050
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1997	4	.120	.092
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	CH CAT	BUCHANAN	1997	15	.070	LT .050
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	CARP	ST LOUIS	1998	25	.095	.083
MDC	701	701/80.7	Missouri R. nr. Columbia	FH CAT	BOONE	1998	15	.058	LT .05
MDC	356	356/112.7	Missouri R. nr. Shoal Cr.	FH CAT	CLAY	1998	15		
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1999	5	.64	.22
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	1999	5	.66	LT.253
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	1999	25	0.047	LT .05
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	1999	5	.23	.187
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	2000	10		.029
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	2000	15		.022
MDC	226	226/93.4	Missouri R. bl. Nodaway R.	CH CAT	ANDREW	2000	15		.0093

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
NDEQ		226/NE	Missouri R. S of Bellevue, NE	CH CAT		2000	5	0.180	.112
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	FH CAT	ST CHARLES	2000	16		.053
EPA/MDNR	356	356/119.2	Missouri R. bl. Blue R.	CARP	CLAY	2001	5	1.5	.802
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	2001	5	.18	.154
EPA/MDNR	226	226/80.5	Missouri R.@St. Joseph, Mo.	CARP	BUCHANAN	2001	5	.084	.262
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	CARP	ST CHARLES	2002	15		.052
MDC	701	701/80.7	Missouri R. nr. Columbia	CARP	BOONE	2002	26		.028
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	FH CAT	ST CHARLES	2002	17		.077
MDC	701	701/80.7	Missouri R. nr. Columbia	FH CAT	BOONE	2002	17		
MDC	226	226/80.5	Missouri R.@St. Joseph, Mo.	FH CAT	BUCHANAN	2002	13		
MDC	356	356/23.4	Missouri R. @ Miami	SHSTUR	SALINE	2004	5		0.165
MDC	356	356/23.4	Missouri R. @ Miami	SHSTUR	SALINE	2004	5		0.278
MDC	356	356/23.4	Missouri R. @ Miami	SHSTUR	SALINE	2004	5		0.229
MDC	701	701/19.7	Missouri R. @ Mokane	SHSTUR	CALLAWAY	2004	1		0.454
MDC	701	701/19.7	Missouri R. @ Mokane	SHSTUR	CALLAWAY	2004	1		1.14
MDC	701	701/19.7	Missouri R. @ Mokane	SHSTUR	CALLAWAY	2004	1		1.52
MDC	701	701/19.7	Missouri R. @ Mokane	SHSTUR	CALLAWAY	2004	5		0.393
MDC	701	701/19.7	Missouri R. @ Mokane	SHSTUR	CALLAWAY	2004	5		0.346
MDC	701	701/19.7	Missouri R. @ Mokane	SHSTUR	CALLAWAY	2004	5		0.807
MDC	701	701/19.7	Missouri R. @ Mokane	SHSTUR	CALLAWAY	2004	1		
MDC	356	356/87.7	Missouri R. @ Napoleon	SHSTUR	LAFAYETTE	2004	6		4.01
MDC	356	356/87.7	Missouri R. @ Napoleon	SHSTUR	LAFAYETTE	2004	15		0.483

Table B: Missouri River Fish Tissue Data Sorted by Year

Org	WBID	+ Site	Site Name	SPECIES	COUNTY	YDATE	NO_SAMPLE	TCHLORDANE	PCB
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	1		0.532
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	1		0.726
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	1		0.758
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	1		0.867
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	1		0.889
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	5		0.22
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	5		0.422
MDC	226	226/99.6	Missouri R. @ Nodaway Island Access	SHSTUR	ANDREW	2004	5		0.23
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	SHSTUR	ST CHARLES	2004	1		0.766
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	SHSTUR	ST CHARLES	2004	1		0.57
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	SHSTUR	ST CHARLES	2004	1		1.1
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	SHSTUR	ST CHARLES	2004	5		0.184
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	SHSTUR	ST CHARLES	2004	5		0.739
MDC	1604	1604/47.5	Missouri R. @ Weldon Spring CA	SHSTUR	ST CHARLES	2004	5		0.431

* Urban
** Rural

\+ Site Designation: WBID/number of miles from mouth

Comment on the Missouri River TMDL

From: Tim Gans, Missouri American Water Company, 314-606-2333
Date: 6/12/06
Method: Phone call rec'd by Anne Peery, TMDL Unit

Tim wanted to know if DNR would be requiring any monitoring of PCBs and chlordane in NPDES permits. After checking with the permits section, he was told there would be no new monitoring requirements. This is because the TMDL is written to fish tissue as a result of PCBs and chlordane in sediment and it is not a water column concern.

Tim said the MO American Water Company would be writing a letter of support for the TMDLs.

Comment on the Missouri River TMDL

From: John Drew, DNR, Water Resources Program, 573-751-6632
Date: 6/14/06
Method: Phone call rec'd by Anne Peery, TMDL Unit

John pointed out that the lengths of the impaired segments add up to 533 miles (in WQS). However on page 3, paragraph 2, the TMDL says the impaired portion starts at River Mile 544, at the border of Iowa and Missouri. That is an 11 mile discrepancy right there. Further, John Drew knows that the actual River Mile at the Iowa border is 552.

We checked with Parsons on where they got their figure of 544 and they agreed to change to RM 552. Barbara Ruppel, GIS technician, says the river will be re-measured with improved tools as ArcView is upgraded and then the standards (WQS) can be corrected accordingly. The following was added to the TMDL as a footnote:

> There is a 19-mile discrepancy between the length of the river (from the Iowa state line to the Mississippi) as recorded in the WQS vs. the mile marker on the river itself at the Iowa line. This amounts to a 3.4 % difference, which is well within the acceptable standard deviation. However, as ArcView becomes more accurate, the river will be re-measured and in due time this will be reflected in the WQS.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

JUL 0 5 2006

Mr. Edward Galbraith, Director
Water Pollution Control Program
Water Protection and Soil Conservation Division
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102

Dear Mr. Galbraith:

RE: Comments on Draft TMDLs public noticed on the MDNR website: Missouri River and Mississippi River.

The U.S. Environmental Protection Agency (EPA) is providing these comments on the proposed final Total Maximum Daily Loads (TMDLs) public noticed on the Missouri Department of Natural Resources (MDNRs) website; http://www.dnr.mo.gov/env/wpp/wpcp-pn.htm.

Missouri River TMDL public notice period June 9, 2006, to July 9, 2006, comments are in enclosure A.

Mississippi River TMDL public notice period June 9, 2006, to July 9, 2006, comments are in enclosure A.

EPA has completed its review of the draft TMDLs on public notice. By this letter, EPA is submitting comments concerning the draft TMDLs as listed in enclosure A. EPA appreciates the opportunity to comment and the thoughtful effort that MDNR has put into these draft TMDLs. EPA will continue to cooperate with and assist, as appropriate, in future efforts by MDNR to develop TMDLs.

If you have any questions or concerns in regards to this matter, please do not hesitate to contact Jack Generaux, TMDL Team Leader, at (913)551-7690, or Tabatha Adkins, TMDL Team, at (913)551-7128.

Sincerely,

John DeLashmit
Chief
Water Quality Management Branch

cc: Ann Crawford, TMDL Chief
Missouri Department of Natural Resources

Phil Schroeder
Missouri Department of Natural Resources

Enclosure A

Regarding: Draft TMDLs for the Missouri and Mississippi Rivers, Chlordane and PCB Impairments

EPA has reviewed the draft documents and has the following comments which need to be addressed in the final TMDL:

We have no specific comments regarding the draft TMDLs as posted by MDNR. As a general observation, most TMDLs generally have targeted water column endpoints but in these instances, the targets were set based on fish tissue levels to protect human health. In some TMDLs developed across the country for fish tissue impairments, a generic translator (bioaccumulation factor) was used to relate the fish tissue to expected water column concentrations. The same approach could have been used here; but, that process would not have changed the conclusions of the TMDL. WLA and LA would still be set to zero because the chemical manufacturing has been stopped and the residual in the environment is degrading (albeit perhaps over a long time). Also identifying seasonal variation is not practical because the fish tissue impairment represents the result of long-term exposures to varied conditions. By continued monitoring of the fish tissue, the public will be kept informed of potential risks and ultimately, the levels should be such that fish advisories will no longer be necessary.

Missouri Department of Health and Senior Services
P.O. Box 570, Jefferson City, MO 65102-0570 Phone: 573-751-6400 FAX: 573-751-6010
RELAY MISSOURI for Hearing and Speech Impaired 1-800-735-2966 VOICE 1-800-735-2466

Julia M. Eckstein
Director

Matt Blunt
Governor

June 23, 2006

John Ford
Department of Natural Resources
Water Quality Monitoring and Assessment Section
Water Protection Program
P.O. Box 176
Jefferson City, MO 65102-0176

Re: *Total Maximum Daily Load for Chlordane and PCBs in the Mississippi River* and *Total Maximum Daily Load for Chlordane and PCBs in the Missouri River*

Dear Mr. Ford:

After reading sections of these Total Maximum Daily Load documents (TMDLs), please consider the following comments:

- Section 1.2. *Problem Identification.* You state that the 2004 sturgeon advisory replaced the chlorinated hydrocarbon pesticide advisory for all waters outside of the Ozark Plateau. The fish advisory history is as follows: First, in 2001, Department of Health and Senior Services (DHSS) ended the chlorinated hydrocarbon pesticide advisory for all waters outside of the Ozark Plateau. Second, the sturgeon advisory has been issued for years, prior to 2004. A more accurate statement would be that in 2002 sturgeon eggs were added to the existing advisory on sturgeon meat that has been in place for the Missouri and Mississippi rivers since 1997. Lastly, you reference Missouri Department of Natural Resource (MDNR 2004) that is not in the reference section. You can quote DHSS instead.

- Section 2.2. *TMDL Endpoint.* First, you use the US Food and Drug Administration (FDA) value of 300 parts per billion (ppb). DHSS provided you with the screening value 100 ppb for the sum of the chlordane isomers. The FDA value that you use is for technical chlordane. In addition, the underlying assumptions used by the FDA methodology were never intended to be protective of recreational fishers that fish the same water body repeatedly over a number of years. Second, our present fish consumption advisory methodology for chlordane (sum of the isomers) is risk-based. Therefore, DHSS may have an advisory for sometime for contaminant concentrations in fish tissue that are below the 100 ppb (or 300 ppb). As you can see in the table below, unrestricted consumption is 100 times below the action level that you are currently using.

Chlordane:	0 to 0.0034 ppm	☐ Unrestricted consumption
	>0.0034 to <0.0067 ppm	☐ 2 meal per week
	>0.0067 to <0.025 ppm	☐ 1 meal per week
	>0.025 to <0.11 ppm	☐ 1 meal per month
	>0.11 ppm	☐ Do not eat

- Also in Section 2.2, you state that these watersheds have neither point-source inputs nor non-point source inputs of chlordane and polychlorinated biphenyls (PCBs). EPA has only banned commercial application of chlordane by licensed pesticide applicators. What prevents a noncommercial application of chlordane by a resident? You should check with the Department of Agriculture's Pesticide Enforcement Division for clarification on the use of chlordane. In addition, there was one National Pollution Discharge Elimination System (NPDES) point into Indian Creek, tributary to the Blue River, with PCBs in the effluent.

- Your margin of safety (MOS) to account for uncertainty states that the "fish advisories will stay in effect until all samples have met the desired endpoints for three consecutive years." Please include a sentence that mentions coordination with DHSS to ensure no threat from PCBs or chlordane level impairing fish consumption.

If you have any question regarding this review, please contact me at 573-751-6102. Thank you.

Sincerely,

Todd Blanc, Environmental Specialist
Bureau of Environmental Epidemiology

cc: Mike McKee. Missouri Department of Conservation
Gale Carlson, BEE Chief
Kristi Campbell
File

MISSOURI DEPARTMENT OF CONSERVATION

Headquarters

2901 West Truman Boulevard, P.O. Box 180, Jefferson City, Missouri 65102-0180

Telephone: 573/751-4115 ▲ Missouri Relay Center: 1-800-735-2966 (TDD)

JOHN D. HOSKINS, Director

July 7, 2006

Department of Natural Resources
WPP
Water Quality Monitoring and Assessment Section
P.O. Box 176
Jefferson City, MO 65102-0176

Dear WPP representative:

I have reviewed the draft TMDLs for the Mississippi and Missouri Rivers and offer the following comments that are relevant to both documents:

Section 1.2 Problem Identification

The Department of Health and Senior Service's 2006 fish consumption advisory (located at http://www.dhss.mo.gov/NewsAndPublicNotices/06FishAdvisory.pdf) recommends limiting consumption to 1 meal/week for catfish greater than 17 inches taken from the Missouri and Mississippi Rivers due to chlordane, PCBs and mercury.

Section 2.2 TMDL Endpoint

The MDNR (2004) citation is not included in the reference section. The 0.01 mg/kg (10 ppb) is from the EPA water quality criteria and is near the detection limits for these compounds. Another document that is well recognized in the literature relative to PCBs in fish is the Great Lakes Protocol. They recommend unrestricted consumption of fish if PCB levels are below 50 ppb. MDNR may also want to review this information in establishing their human health screening level. The document can be retrieved at (http://www.fish.state.pa.us/Fish/fishtech.pdf).

Table B

Need to add units to the columns for Technical Chlordane and PCBs (e.g. parts-per-million or ppm). Also, values in these columns are sometimes preceded by LT. You should identify what the abbreviation stands for. I assume that Technical Chlordane reflects actual quantitation of the entire chlordane mixture and not a sum of certain isomers. If only part of the isomers were summed to get the chlordane value then a more restrictive screening level should be used (contact the Department of Health and Senior Services for details).

Sincerely,

Michael J. McKee, Ph. D.
Resource Scientist
Resource Science Center
Missouri Department of Conservation

Cc: Karen Bataille, MDC
Todd Blanc, DHSS

Mohsen Dkhili/WPCP/DEQ/MODNR
07/10/2006 12:46 PM

To: Phil Schroeder/WPCP/DEQ/MODNR@MODNR, Anne Peery/WPCP/DEQ/MODNR@MODNR
cc:
bcc:
Subject: Fw: Missouri's TMDL Listing for the Missouri and Mississippi Rivers

History: This message has been forwarded.

FYI and action as you see fit.
---- Forwarded by Mohsen Dkhili/WPCP/DEQ/MODNR on 07/10/2006 12:44 PM -----

Franz.William@epamail.epa.gov
07/10/2006 12:46 PM

To: mohsen.dkhili@dnr.mo.gov, mark.osborn@dnr.mo.gov
cc: dhokanson@umrba.org, Maraldo.Dean@epamail.epa.gov, Wilkinson.Bruce@epamail.epa.gov, Shepard.Larry@epamail.epa.gov, Delashmit.John@epamail.epa.gov
Subject: Missouri's TMDL Listing for the Missouri and Mississippi Rivers

Mohsen:

As part of our efforts to support and work with the States though the Water Quality Task Force of the Upper Mississippi River Basin Association we have some comments regarding the Proposed Listing for the Missouri and Mississippi Rivers. Our comments are attached.

If you have any questions regarding these comments please do not hesitate to call me at 312/886-7500 or by responding to this e-mail.

Bill

(See attached file: Comments%20on%20the%20Proposed%20TMDL%20for%20the%20Missouri%20and%20Mississippi%20Rivers%20in%20the%20State%20of%20Missouri.doc)

William D Franz
USEPA, Region 5
77 West Jackson Boulevard
Mail Code: W-15J
Chicago, IL 60604-3507

Bill Franz
Upper Mississippi River Team Manager
312/886-7500
312/8860957 fax

Comments%20on%20the%20Proposed%20TMDL%20for%20the%20Missouri%20and %20Mississippi%20Rivers%20in%20the%20State%20of%20Missouri.c

(HC: this file attached. See next pg)

(Received at DNR via e-mail to Mohsen Dkhili on 7/10/06 from William (Bill) Franz, EPA)

Comments on the Proposed TMDL for the Missouri and Mississippi Rivers in the State of Missouri

The principal rationale for Missouri's 0 Waste Load Allocations and Load Allocations for PCBs is that PCBs are banned and that "no additional loading [of PCBs] should occur" [page 8].

This statement is a bit misleading. Although production of PCBs was banned in 1977, PCBs are still released into the general environment. Note that the ban was on the manufacture, processing, and distribution in commerce of PCBs. The ban did not extend to products containing PCBs, such as transformers. Current sources of PCBs include poorly maintained or uncontrolled toxic waste sites; illegal or improper dumping of PCB wastes, such as transformer fluids; leaks from electrical transformers containing PCBs; disposal of PCB-containing products in landfills; sediment resuspension; air deposition; and byproducts of some industrial processes. The fact that we have many programs dealing with PCB cleanup/restoration, (e.g., Superfund - Hudson & Fox River, RCRA -Grand Cal, GLNPO Great Lakes dredging projects) highlights the ongoing problem.

The statement that *"Since Chlordane and PCBs were banned in 1988 and 1977, respectively, there will be no discharge of Chlordane or PCBs into streams from wastewater treatment plants and other point sources"* [page 8] should be reconsidered. Wastewater treatment plants continue to discharge PCBs. For example, PCB monitoring conducted in the Delaware River, as part of the Delaware River TMDL Program, indicated that loadings to the river and estuary from point sources were *"significant and of such magnitude to cause the water quality standards to be exceeded."* As a result, the Delaware River TMDL established wasteload allocations for 142 point sources, including many WWTP's. Also, in the Ohio River, ORSANCO conducted high-volume sampling of effluent at 11 POTWs along the river. Levels in all samples far exceeded Water Quality Standards for PCBs.

Furthermore, based on the results of pesticides brought to clean sweeps in Region 5, there continues to be sources of chlordane which may become contaminants if not disposed of properly. Just a few examples of quantities of chlordane which have been removed from the Region in clean sweep programs (these numbers are estimates based on percent of active ingredient of the chlordane products brought in for disposal):

in 2004: **25** pounds of chlordane in Illinois
in 2005: **500** pounds of chlordane in Michigan and **1597** pounds of chlordane in Minnesota were turned in to clean sweep programs.
Indiana has removed a total of **1264** pounds of chlordane (cumulative total through 2005) in its clean sweep program.

Some of the chlordane collected came from homeowners who potentially could have disposed of the pesticide by either throwing it in the garbage or dumping it down the sink if the Clean Sweep program did not exist. In addition, chlordane was used to control ants and termites in structures, and was used to control insects in lawns, gardens, corn, vegetables, citrus, fruits and nuts. As a result of this past widespread use, the potential for contamination of fish tissue is still remains through contaminated sediment and stored old pesticide product even though these products has been cancelled.
We recommend that in light of the comments above consideration should be given to the development of Waste Load Allocations and Load Allocations for both PCBs and chlordane. The Waste Load Allocations and Load Allocations should be established at level designed to achieve Water Quality Standards and to protect the health of the ecosystem and avoid fish consumption advisories. We would be willing to work with the Missouri Department of Natural Resources

(Received at DNR via e-mail to Mohsen Dkhili on 7/10/06 from William (Bill) Franz, EPA)

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Mark Osborn/WPCP/DEQ/MODNR
07/25/2006 03:05 PM

To Anne Peery/WPCP/DEQ/MODNR@MODNR
cc
bcc
Subject Fw: comments from UMRBA

History: This message has been replied to.

Mark Osborn
Environmental Specialist
Water Protection Program
(573) 522-2019
mark.osborn@dnr.mo.gov

----- Forwarded by Mark Osborn/WPCP/DEQ/MODNR on 07/25/2006 03:05 PM -----

"Zhang, Harry" <Harry.Zhang@parsons.com>
07/25/2006 02:51 PM

To "Mark Osborn" <mark.osborn@dnr.mo.gov>
cc
Subject RE: comments from UMRBA

Mark:

See brief reply below.

- Harry

Reply:

Parsons is under national EPA contract to provide technical support to EPA Region 7 states. During this task order project, Parsons reviewed EPA Region 7 approved TMDL examples in Missouri, Kansas and Iowa. All of them set Wasteload Allocations and Load Allocations as zero based on the fact that PCB and Chlordane was banned by EPA about twenty years ago. Parsons agree with this technical approach. Therefore, similar methodology was used in this TMDL.

From: Mark Osborn [mailto:mark.osborn@dnr.mo.gov]
Sent: Tuesday, July 25, 2006 12:21 PM
To: Zhang, Harry
Subject: comments from UMRBA

Harry,

I left you a voice-mail message on this. Upper Mississippi River Basin Association (UMRBA) has the same issure as was expressed last March. Please review and let me know if you have further response to them.

WQMB Rec'd OCT 1 1 2006

STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

August 22, 2006

Mr. Todd Blanc
Missouri Department of Health and Senior Services
P.O. Box 570
Jefferson City, MO 65102-0570

Dear Mr. Blanc:

Thank you for reviewing the Mississippi and Missouri Rivers Total Maximum Daily Loads (TMDLs) and taking the time to comment on behalf of the Missouri Department of Health and Senior Services (DHSS).

- Section 1.2. Problem Identification
  To address your concern, the following sentence was deleted:
  > This advisory was replaced by the 2004 advisory for the Mississippi River which recommends that no sturgeon or sturgeon eggs should be eaten due to elevated levels of chlordane and PCBs (MDNR, 2004). (deleted)

  It was replaced with this sentence stating:
  > In 2002, sturgeon eggs were added to the existing advisory on sturgeon meat, which has been in place for the Mississippi River since 1997. (added)

- Section 2.2. TMDL Endpoint
  As discussed with you via e-mail, we acknowledge that the Department of Natural Resources (department) has been collecting chlordane as sum of the isomers (four agreed on isomers), which carries the screening value of 0.1 mg/kg. Therefore, we have changed the TMDL endpoint from 0.3 mg/kg technical chlordane to 0.1 mg/kg as sum of the isomers.

  Regarding your comment on the potential for continuing addition of chlordane and PCBs to the environment; the department acknowledges that there is still unused chlordane that could potentially enter the rivers. Although the pesticide is banned for all uses, there is nothing to prevent a citizen from applying chlordane. Mr. Paul Andre with the Missouri Department of Agriculture's (MDA) Pesticide Program, does not believe there is enough leftover chlordane to have a measurable negative impact on these rivers. MDA and our department have fielded very few phone calls about how to dispose of chlordane. Further investigation revealed that very little chlordane has been turned in at hazardous waste collection points throughout Missouri. The department is considering instigating some form of a "clean sweep" program to try and net the chlordane that is still being stored at someone's residence.

The permit mentioned is not of immediate concern in the Missouri River TMDL because it discharges to Indian Creek and then to the Blue River (both classified) before reaching the Missouri. PCBs are unlikely to reach levels of concern in the Missouri or Mississippi Rivers due solely from the one permitted outfall. Also, the facility is the subject of a Settlement Agreement (not yet finalized) dealing with PCBs.

Margin of Safety:

We included the following sentence: The department will endeavor to coordinate with DHSS in guarding against threats to human health associated with fish consumption from these two contaminants.

As always, DHSS' participation in the TMDL process and concern for the health of Missouri's water resources is appreciated. Your comments made this a better TMDL. If you have other questions or wish to discuss this further, please contact Ms. Anne Peery at (573) 526-1426 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM

Philip A. Schroeder, Chief
Water Quality Monitoring and Assessment Section

PS:apl

STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

August 22, 2006

Mr. John DeLashmit
U.S. Environmental Protection Agency
Region VII
901 North Fifth Street
Kansas City, KS 66101

RE: Response to Comments on the Mississippi and Missouri Rivers Total Maximum Daily Loads

Dear Mr. DeLashmit:

This letter responds to comments from the U.S. Environmental Protection Agency (EPA) on the draft Total Maximum Daily Loads (TMDLs) for the Mississippi and Missouri Rivers.

We appreciate your observations. In response to public comments received during the comment period, however, the Department of Natural Resources (department) has made changes to the TMDL targets. In light of this, we will place these documents on public notice again. Enclosed please find the comments and the department's responses.

Thank you for your comments and for EPA's support in the TMDL process. If you have other questions or wish to discuss this further, please contact Ms. Anne Peery at (573) 526-1426 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM

Philip A. Schroeder, Chief
Water Quality Monitoring and Assessment Section

PS:apl

Enclosure

STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

August 22, 2006

Mr. Mike McKee
Missouri Department on Conservation
2901 West Truman Boulevard, P.O. Box 180
Jefferson City, MO 65102-0180

Dear Mr. McKee:

Thank you for reviewing the Mississippi and Missouri Rivers Total Maximum Daily Loads (TMDLs) and taking the time to comment on behalf of the Missouri Department of Conservation (MDC). The following responses correspond to your comments in the order they were written.

- Section 1.2 Problem Identification
  The Web page address for the Department of Health and Senior Services (DHSS) 2006 Fish Advisory has been included in the TMDL.

- Section 2.2 TMDL Endpoint
  The Department of Natural Resources (department) citation was removed. Actually, the department uses 2.0 mg/kg (the Food and Drug Administration recommendation) to judge impairment of a water body for PCBs, not the 0.01 mg/kg as stated. This level is what DHSS uses in their fish advisories. The endpoint has been changed to 2.0 mg/kg in the TMDL.

- Table B
  DHSS also pointed out the issue of which type of chlordane was being reported. DHSS uses the sum of the isomers as does our department. The data table and chlordane graph has been adjusted and units have been added. The abbreviation LT stands for "less than" and is not used in the revised data table.

As always, MDC's participation in the TMDL process and concern for the health of Missouri's water resources is appreciated. If you have other questions or wish to discuss this further, please contact Ms. Anne Peery at (573) 526-1426 1426 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM

Philip A. Schroeder, Chief
Water Quality Monitoring and Assessment Section

PS:apl

STATE OF MISSOURI Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

August 22, 2006

Mr. William D. Franz
U.S. Environmental Protection Agency, Region 5
77 West Jackson Boulevard
Mail Code: W-15J
Chicago, IL 60604-3507

Dear Mr. Franz:

Thank you for reviewing the Mississippi and Missouri Rivers Total Maximum Daily Loads (TMDLs) and taking the time to comment on behalf of the Upper Mississippi River Basin Association.

We revised the TMDL in response to your concern that the TMDLs do not adequately address the potential (but unknown and uncharted/documented) contributions to the environment of these pesticides. Instead of simply saying they have been banned and are no longer entering the environment, we have now stated that we acknowledge the potential for minor levels of these compounds to enter the environment. The department does not see any valid reason to include a Waste Load Allocation and a Load Allocation in the TMDLs (other than zero) because the endpoints are not based on the mere existence of these compounds in waters, but rather on fish tissue levels and health advisories. Since chlordane and PCBs have been banned, our "implementation plan" is simply to keep monitoring to ensure the levels of these pesticides in fish tissue keep declining. Also, our data have not indicated any significant levels of these compounds being discharged from Missouri wastewater facilities either directly to these rivers or to any unclassified tributaries of the rivers. Therefore, we feel it is unnecessary to calculate these loads in the TMDL in order to ensure improvements in water quality.

You may be interested that Missouri is planning to increase efforts to collect unused inventories and supplies of these compounds that may currently be sitting unnoticed at residences across the state. Also, note that the endpoints for both compounds have been altered in the TMDL: chlordane was changed to 0.1 mg/kg as the sum of the chlordane isomers and PCBs was changed to 2.0 mg/kg. As a result, both documents will be placed on 30-day public notice again. You will be notified accordingly.

The Upper Mississippi River Basin's Association participation in the TMDL process and concern for the health of Missouri's water resources is appreciated. If you have other questions or wish to discuss this further, please contact Ms. Anne Peery at (573) 526-1426 1426 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

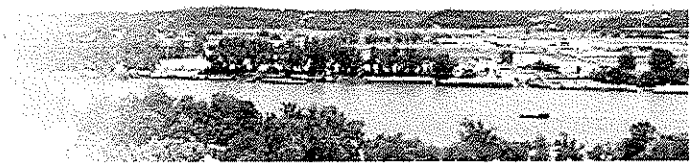
WATER PROTECTION PROGRAM

Philip A. Schroeder, Chief
Water Quality Monitoring and Assessment Section

PS:apl

Divisions and Programs

Missouri Department of
Natural Resources
Division of Environmental Quality



Second Public Notice

Beginning Date: Aug. 30, 2006
Ending Date: Sept. 29, 2006

Name: Draft Missouri River Total Maximum Daily Load (TMDL)
Location: Across 25 Missouri Counties

Purpose: A draft copy of the revised Missouri River TMDL is available for public review and comment. This is a second public notice for the TMDL, which was substantially altered (including the endpoints) in response to comments received during the first public notice.

Description: The Missouri River is listed for impairment due to elevated levels of Chlordane and Polycholorinated Biphenyls (PCBs) in fish tissues. Both chlordane and PCBs are now banned. Therefore, the TMDL proposes continued monitoring of the Missouri River to assure that levels of these pollutants are decreasing. Section 303(d) of the Clean Water Act requires a listing of impaired waters. All waters listed must have a TMDL written for them. These are water bodies that do not meet the Missouri Water Quality Standards even after implementing existing regulatory programs. A TMDL document provides background information on the water body, a calculation of the maximum pollutant load the system can incorporate without being impaired, an implementation plan to restore water quality and, in some instances, a continuous monitoring plan. The Missouri River TMDL Information Sheet provides background material for this document.

Obtain a Copy: Copies of the TMDL can be obtained by calling the department's Water Protection Program (WPP) at 1-800-361-4827 or (573) 751-6623.

Draft Missouri River TMDL
www.dnr.mo.gov/env/wpp/tmdl/missouri-r-draft-tmdl.pdf

Missouri River TMDL Information Sheet
http:// www.dnr.mo.gov/env/wpp/tmdl/info/missouri-r-chlor-pcb-info.pdf

General TMDL information
http://www.dnr.mo.gov/env/wpp/tmdl/index.html

Invitation to Comment: The interested public is encouraged to participate in this process if they have concerns regarding the content of this document or if they would like to provide written support for the process. The program will accept written comments regarding the Missouri River TMDL through Sept. 29, 2006.

Address: Comments should be sent to: Department of Natural Resources, WPP, Water Quality Monitoring and Assessment Section, P.O. Box 176, Jefferson City, MO 65102-0176

For more Information: For more information on TMDL issues, see the Environmental Protection Agency (EPA) Web site.

For an explanation of Total Maximum Daily Loads, see the *Total Maximum Daily Loads* PDF fact sheet.

Department of Natural Resources
P. O. Box 176, Jefferson City, MO 65102
1-800-361-4827 / (573) 751-1300
E-mail: cleanwater@dnr.mo.gov
Revised on Friday September 08 2006

Missouri Department of Natural Resources
Water Protection Program

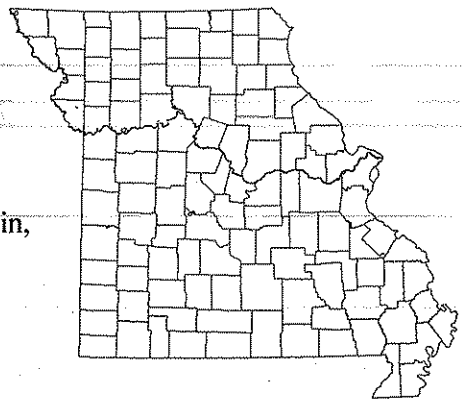
Total Maximum Daily Loads (TMDLs)
for
Chlordane and Polychlorinated Biphenyls
in the
Missouri River

DRAFT

August 2006

2nd PN
8-30-06 to 9-29-06

DRAFT Total Maximum Daily Loads (TMDLs)
For the Missouri River
Pollutants: Chlordane and Polychlorinated Biphenyls (PCBs) in Fish Tissue



Name: Missouri River

Location: Across 25 counties: Atchison, Holt, Andrew, Buchanan, Platte, Clay, Jackson, Ray, Lafayette, Carroll, Saline, Chariton, Howard, Cooper, Moniteau, Boone, Cole, Callaway, Osage, Montgomery, Gasconade, Warren, Franklin, St. Charles and St. Louis

Hydrologic Unit Codes (HUC): 10240001, 10240005, 10240011, 10300101, 10300102, 10300200

Water Body Identification Numbers (WBID): (from the mouth at St. Louis to the Iowa border)1604 (100 miles), 701 (129 miles), 356 (125 miles) and 226 (179 miles)

Missouri Steam Classification: The Missouri River is classified in the Missouri Water Quality Standards (WQS) as a Class P[1] stream

Beneficial Uses for Missouri River[2]:
- Livestock and Wildlife Watering
- Protection of Aquatic Life and Human Health – Fish Consumption
- Whole Body Contact Recreation, Category B
- Secondary Contact Recreation
- Irrigation
- Drinking Water Supply
- Industrial

Pollutant: Chlordane and PCBs in fish tissue

Size of Impaired Segment: 533 miles

Pollutant Source: Many point and nonpoint sources

TMDL Priority Ranking: High

[1] Class P streams maintain permanent flow even in drought periods
[2] For beneficial uses see 10 CSR 20-7.0310(C) and Table (H)

1. Introduction

1.1 Study Area Description:

The Missouri River is 2,565 mile long starting at its headwaters in the Jefferson, Madison and Gallatin Rivers, which converge near Three Forks, Montana, to form the Missouri River. The river flows north through mountainous canyons before emerging from the mountains near Great Falls, Montana. It flows east across the plains of Montana into North Dakota, then turns southeast flowing into South Dakota and along the north and eastern edge of Nebraska. The river forms part of Nebraska's border with South Dakota and nearly its entire boundary with Iowa, flowing past Sioux City and Omaha. The river forms the entire boundary between Nebraska and Missouri and part of the boundary between Missouri and Kansas. At Kansas City, the river turns eastward and flows across Missouri where it joins the Mississippi River just north of St. Louis. The Missouri River sub-basin is the largest sub-basin in the Mississippi River basin, covering more than 500,000 square miles.

The TMDL discussed in this report is for the portion of the Missouri River that begins on the border of Iowa and Missouri, approximately 10 miles north of Watson, Missouri, at River Mile 552 (Figure 1). Table A in the appendix provides a detailed description of the 25 sampling locations along the Missouri River shown in Figure 1. Land use for this 533-mile portion[3] of the Missouri River is shown in Figure 2. Within the impaired segments, three major tributaries enter the Missouri River. These tributaries are the Platte, Blue and Osage Rivers, and their confluences are at Missouri River Miles 391, 358 and 133, respectively. Table 1 summarizes the information on the impaired segments in the Missouri River based on the 2002 303(d) listing.

Table 1: Missouri 2002 303(d) List for Impaired Segments in Missouri River

WBID	Waterbody	Size	Unit	Pollutant	Downstream County	Upstream County	Priority
1604	Missouri River	100	Miles	Chlordane, PCBs	St. Louis	Gasconade	High
701	Missouri River	129	Miles	Chlordane, PCBs	Gasconade	Chariton	High
356	Missouri River	125	Miles	Chlordane, PCBs	Chariton	Jackson	High
226	Missouri River	179	Miles	Chlordane, PCBs	Jackson	Atchison	High

[3] There is a 19-mile discrepancy between the length of the river (from the Iowa state line to the Mississippi) as recorded in the WQS vs. the mile marker on the river itself at the Iowa line. This amounts to a 3.4 percent difference, which is well within the acceptable standard deviation. However, as ArcView becomes more accurate, the river will be re-measured and in due time this will be reflected in the WQS.

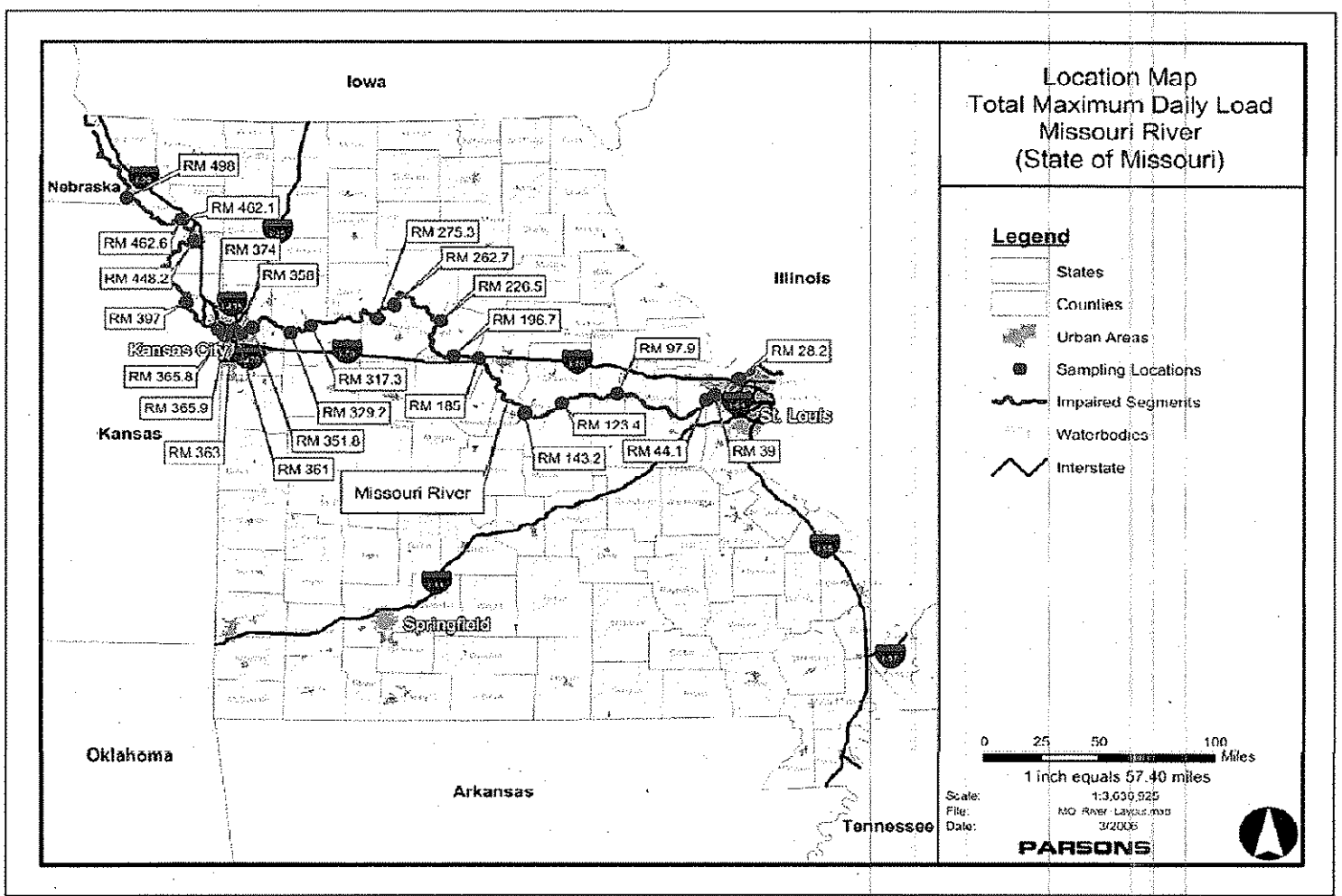


Figure 1: Location Map for Impaired Segments in Missouri River

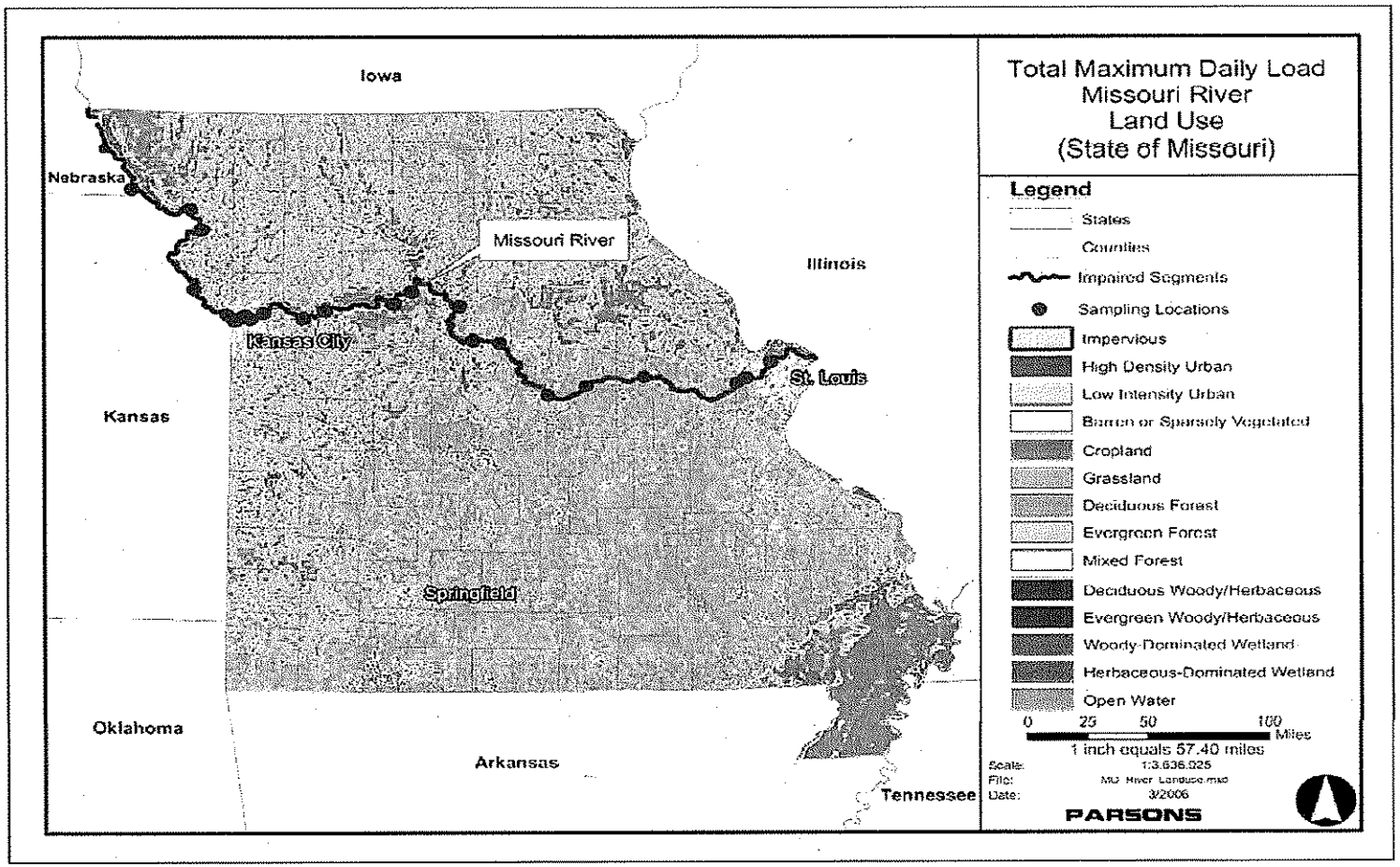


Figure 2: Land Use for Missouri River Watershed within State of Missouri

1.2 Fish Advisories in Missouri:
The Missouri Department of Conservation (MDC) has monitored levels of toxic contaminants in fish from Missouri lakes and rivers since 1984. At that time, MDC discovered elevated levels of chlordane in fish in the Missouri, Mississippi and Meramec rivers. MDC, the U.S. Environmental Protection Agency (EPA) and the department all provide fish tissue sample results to the Missouri Department of Health and Senior Services (DHSS) for use in determining health risks to fish consumers. DHSS, in turn, issues fish consumption advisories. DHSS has issued advisories based on pesticide contaminants in fish since 1985. Past DHSS fish advisories instructed anglers to limit consumption of fatty fish (carp, catfish, buffalo, drum, suckers and paddlefish) to one meal per week. This advisory was rescinded in 2001. Trout also have a high level of fat, but are considered safe to eat from anywhere in the state. In 2002, sturgeon eggs were added to the only existing PCB advisory, which has been in place for sturgeon meat from the Missouri River since 1997.

DHSS issues its fish advisory every year around March or April. The advisory is made available to the public through press releases and may be accessed by calling DHSS at 1-866-628-9891. These advisories are also distributed to all Missouri county health departments and are posted on the Internet. The 2006 advisory may be found at www.dhss.mo.gov/NewsAndPublicNotices/06FishAdvisory.pdf.

2. Description of the Applicable Water Quality Standards

2.1 Beneficial or Designated Uses:
These uses are listed on page one. The use that is impaired is protection of warm water aquatic life and human health associated with fish consumption.

2.2 Anti-degradation Policy:
Missouri's WQS include EPA's "three-tiered" approach to anti-degradation and may be found at 10 CSR 20-7.031(2).

Tier 1 – Protects existing uses and provides the absolute floor of water quality for all waters of the United States. Existing instream water uses are those uses that were attained on or after Nov. 29, 1975, the date of EPA's first WQS regulation, or uses for which existing water quality is suitable unless prevented by physical problems such as substrate or flow.

Tier 2 – Protects the level of water quality necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water in waters that are currently of higher quality than required to support these uses. Before water quality in Tier 2 waters can be lowered, there must be an anti-degradation review consisting of: (1) a finding that it is necessary to accommodate important economical or social development in the area where the waters are located; (2) full satisfaction of all intergovernmental coordination and public participation provisions; and (3) assurance that the highest statutory and regulatory requirements for point sources and best management practices for nonpoint sources are achieved. Furthermore, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses.

Tier 3 – Protects the quality of outstanding national resources, such as waters of national and state parks, wildlife refuges and water of exceptional recreational or ecological significance. There may be no new or increased discharges to these waters and no new or increased discharges to tributaries of these waters that would result in lower water quality (with the exception of some limited activities that result in temporary and short-term changes in water quality).

2.3 Specific Criteria:

2.3.1 Chlordane

The specific criteria for chlordane are found in Missouri's Water Quality Standards, 10 CSR 20-7.031, Table A, under Persistent, Bioaccumulative, Man-made Toxics. The limit for chlordane *in water* related to human health protection associated with fish consumption is 0.00048 micrograms per liter (µg/L or parts per billion). However, elevated chlordane levels in water are not the problem. As chlordane tends to bioaccumulate in fish, this TMDL will be based on fish tissue chlordane levels. Fish tissue levels refer to the amount of chlordane in the fillet, or edible portion, of fish. The U.S. Food and Drug Administration (FDA) developed a fish tissue action level of 0.3 milligrams per kilogram (mg/kg or parts per million) for technical grade chlordane. Note: 1 kilogram equals approximately 2.2 pounds. However, the department and DHSS use the action level of 0.1 mg/kg sum-of-the-isomers of chlordane.[4] If the level of a toxic contaminant exceeds this action level or the unrestricted consumption level, a fish consumption limit advisory that provides a risk-based, safe consumption level for target populations is issued regarding the potential health risk associated with long-term consumption of contaminated fish.

2.3.2 PCBs

The specific criteria for PCBs are found in Missouri's WQS, 10 CSR 20-7.031, Table A, under Persistent, Bioaccumulative, Man-made Toxics. The limit for PCBs *in water* related to human health protection associated with fish consumption is 0.000045 µg/L. The FDA set a 2.0 mg/kg limit on PCBs in fish tissue for interstate shipment of fish for human consumption. DHSS currently uses this number to issue fish advisories related to PCBs and the department uses the same number to judge impairment of Missouri water bodies by PCBs. However, DHSS has a revised fish advisory methodology that follows EPA guidance, so the threshold value for PCBs will change. The new threshold value for unrestricted consumption is expected to be 0.04 mg/kg of total PCBs in fish tissue. Following adoption of these new guidelines by DHSS, the next state 303(d) listing methodology document will acknowledge them and may be revised accordingly.

[4] Data can be collected as technical chlordane or sum-of-the-isomers of chlordane, in which case the action level is 0.1 mg/kg. Sum-of-the-isomers of chlordane is usually comparable to FDA's action level of 0.3 mg/kg technical grade chlordane when the contamination is recent, because there is a lot of the technical chlordane still present. However, after a few years the comparison no longer works well. The department, MDC, EPA and DHSS quantify chlordane by summing the following four chlordane isomers: cis-chlordane, trans-chlordane, cis-nonachlor and trans-nonachlor.

3. Current Water Quality Condition and Desired Endpoint

3.1 Current Water Quality Condition:

Several agencies collected fish tissue samples at numerous monitoring sites along the Missouri River from 1976 to 2004. The goal of the fish tissue monitoring and survey program was to analyze fish tissue samples for chlordane and PCBs in order to define water body segments impacted by contamination. Bottom feeding fish such as carp were sampled because of their feeding or dwelling preferences near the bottom of the water column where chlordane and PCBs remain in the sediments.

Even though they have been banned, both chlordane and PCBs degrade very slowly, making them particularly persistent in the environment. They remain in the soil for long periods of time. Because these pollutants are not soluble they are not readily found in the water column. Instead they adsorb to soil particles in lakebed or streambed sediments. Bottom-feeding fish, such as carp, become exposed to chlordane and PCBs due to their feeding and dwelling preferences near streambeds or lakebeds where contaminated sediments persist. Fish uptake these pollutants in water through their gills and through the consumption of contaminated aquatic organisms. Once the pollutants are absorbed into the bloodstream, they accumulate primarily in fatty tissues. Once in the fatty tissues, the pollutants have the ability to biomagnify, or increase in concentration, as the compound is transferred through the food chain. These fish include fatty fish, such as carp, catfish, buffalo, drum, suckers and paddlefish.

3.2 TMDL Endpoint:

The department uses threshold levels of 0.1 mg/kg of chlordane (sum of isomers) and 2.0 mg/kg of total PCBs in fish tissue to determine support of the designated use. As just stated, because DHSS has a revised fish advisory methodology that follows EPA guidance, the threshold value for PCBs will change. The new threshold value for unrestricted consumption will be 0.04 mg/kg of total PCBs in fish tissue. If the average levels of these compounds exceed these levels in fillets of the fish sampled, the water body is considered to be not supporting the fish consumption use. These will be used for the endpoints for these TMDLs and the achievement of these targets should lead to the removal of fish consumption advisories. Missouri's protocol for removing or down grading an advisory requires at least two years of data below these targets.

4. Source Inventory and Assessment

4.1 Chlordane:

Chlordane has been identified as a pollutant of concern because it is a bio-accumulative pesticide that is carcinogenic and can cause both acute and chronic toxic effects. Its polycyclic chlorinated organic structure produces deleterious biological effects similar to those of DDT, PCBs and other related substances (MDE, 2000).

Chlordane is a manufactured chemical that was used as a pesticide in the U.S. from 1948 to 1988 (ATSDR, 1995). Since its introduction in the 1940s, chlordane was used as a broad-spectrum pesticide for agricultural, home and commercial control of insects until it was withdrawn from the

market in 1988. The original source of chlordane was runoff, particularly from urban areas where widespread termite eradication occurred around homes in the 1970s and 1980s. Chlordane was also used at nurseries, on golf courses and in agriculture. Chlordane was banned for agricultural use in 1975 and for all uses in 1988; therefore, no additional loading should occur. Some of its trade names include Oktachlor and Velsicol 1068 (ATSDR, 1995). At the height of production, chlordane was the second most widely used organochlorine insecticide in the U.S., with annual production of about 11 million kg/year. Production in the U.S. in 1974 amounted to 9.5 million kg (IPCS, 1988). Over 70,000 tons of chlordane has been manufactured since 1946 (U.S. EPA, 1998).

As previously mentioned, chlordane degrades very slowly, and thus is extremely persistent in the environment (with the ability to stay in the soil for over 20 years). It bio-accumulates in the tissue of bottom-feeding fish (such as carp) which become exposed to chlordane due to their feeding or dwelling preferences near chlordane-contaminated sediments. Eating fish contaminated by chlordane will not make a person immediately ill. However, over a long period of time, chlordane may damage the nervous system, digestive system and the liver (MDNR, 2001).

The department recognizes that there is still chlordane in products in storage sheds, barns and basements. It is possible that chlordane could still find its way into the environment through leaks, use of the product or improper disposal. However, it is estimated that the amount that might actually reach the river is negligible.[5] The reasons for this are: 1) since it has been banned since 1988, the number of people who still have a product containing chlordane is small, 2) chlordane would be only a small portion of the ingredients in the product, 3) The number of people who would use the product is smaller yet and 4) if applied according to directions, it should not cause a problem. Overall, there is no reason to expect that the levels of chlordane in the environment, and therefore chlordane levels in fish tissue, will do anything but decline in the future.

4.2 Polychlorinated Biphenyls (PCBs):

PCBs are a mixture of up to 200 different chlorinated compounds and are stable under conditions of high pressure and high temperature. PCBs are manmade compounds that have been used commercially since 1929. These chemicals were manufactured as combinations of chlorinated biphenyls that differed according to the percentage of chlorine in the mixture. PCBs had a wide variety of industrial applications due to their chemical stability and flame resistance. However, these characteristics also enabled them to remain highly persistent in the environment. PCBs were commonly used as plasticizers, heat-transfer fluids, solvent extenders, hydraulic fluids, flame retardants, sealers, ink carriers, organic diluents and dielectric fluids. They are found in transformers, capacitors, florescent lighting fixtures, televisions, computers, microscope oil, hydraulic oil, caulking compounds and elastic sealant made from 1966 to 1975. The manufacturing of PCBs stopped in the United States in 1977 due to concerns about the persistence of PCBs in the environment and evidence that they bioaccumulate, which can cause harmful health effects.

U.S. industry purchased approximately 1.25 billion pounds of PCBs by the time production stopped in 1977 (U.S. EPA, 1993). EPA estimates that 60 percent, or 750 million pounds, of PCBs produced are still in use in the U.S. in approximately 150,000 PCB transformers and 2.5 million mineral oil transformers (Graham, 1987). Another 36 percent (450 million pounds) of PCBs were

[5] Personnel correspondence with Paul Andre, Missouri Department of Agriculture, Pesticide Program, 7/06.

either placed in landfills or dumps or were available to biota via air, water, soil and sediments. The remaining four percent (55 million pounds) were destroyed by incineration or were degraded in the environment (U.S. EPA, 1993). Monsanto Chemical Company in Sauget, Illinois, produced approximately 99 percent of commercial PCBs for U.S. industry and sold the compounds under the trade name Aroclor (ATSDR, 1995a). A four digit numbering code identifies the Aroclors. The first two digits denote the number of carbon atoms in the biphenyl group and the last two digits represent the approximate percentage of chlorine in the mixture. The most common PCBs manufactured include Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260 (Cairns et. al., 1986).

The behavior of PCBs differs depending on the number of chlorine atoms present. Generally, these compounds are relatively insoluble and have the ability to absorb strongly into organic matter. As the chlorine content increases, the solubility of the compounds decrease and the mixture becomes more viscous. PCBs are highly lipophilic (fat loving) and bio-accumulate in fish tissue, which can result in very high concentrations that are unsafe for human consumption (U.S. EPA, 1980). Currently, the primary source of PCB ingestion is through the consumption of contaminated fish (USDHHS, 1995). Fish uptake of PCBs in water through their gills and through the consumption of contaminated aquatic organisms. As with chlordane, PCBs are absorbed into the bloodstream and accumulate primarily in fatty tissues. In these fatty tissues, they have the ability to biomagnify or increase in concentration, as the compound is transferred through the food chain. In humans and other mammals, PCBs accumulate in the gastrointestinal tract, adipose (fatty) tissue and skin.

As already stated, U.S. production of PCBs ended in 1977 because of the evidence that they accumulate in the environment, which can cause harmful health effects. Although production of PCBs was banned, note that the ban was on the manufacture, processing, and distribution in commerce of PCBs. The ban did not extend to existing products containing PCBs, such as transformers. Poorly maintained hazardous waste sites that contain PCBs, industrial and municipal incinerators burning organic waste, illegal or improper dumping of PCB wastes (such as transformer fluids and some capacitors) and leaks from electrical transformers continue to release PCBs into the environment. However, since PCBs are no longer produced, a downward trend in the environment is inevitable.

5. Determination of TMDL and Allocation[6]

The following equation was used to calculate the TMDL.

TMDL = WLA + LA + MOS (Eq. 1)

where:

TMDL: Total Maximum Daily Load
WLA: Waste Load Allocation (for point sources)
LA: Load Allocation (for non-point sources)
MOS: Margin of Safety (to account for uncertainties)

[6] Calculations and graphs by Parsons Corporation, a Pasadena-based engineering and construction firm

5.1 TMDL/Loading Capacity:
TMDL or loading capacity is defined as the maximum pollutant load that a water body can assimilate and still attain WQS. EPA banned the use of chlordane in 1988. While the department recognizes that there is still chlordane in existence that is unaccounted for, with the potential to enter the river system, the amount that might actually reach the river is believed to be negligible (see section 4.1). Again, there is no reason to expect that the levels of chlordane in the environment and in fish tissue will do anything but decline in the future. Therefore, the TMDL for chlordane in the 533 mile impaired segment along the Missouri River is set as zero pounds/day.

Similarly, EPA banned the use of PCBs in 1977. Again, the department acknowledges that there is the potential for a certain amount of PCBs to leak into the environment (see Source Inventory-PCBs above). However, judging from the available data, that amount is deemed to be small and declining. Therefore, the TMDL for PCBs in the 533 mile impaired segment along the Missouri River is set as zero pounds/day.

5.2 Waste Load Allocation:
As stated earlier, these two compounds are mainly a sediment issue and amounts in the water column are virtually non-detectable. There are no Missouri facilities which discharge either directly to the Missouri River or to a tributary where the Missouri River is the first classified water body, that have that potential for discharging detectable amounts of PCBs or chlordane. Since chlordane and PCBs were banned in 1988 and 1977, respectively, there should be negligible discharge of chlordane and PCBs into streams from wastewater treatment plants and other point sources. Therefore, the WLA is set as zero pounds/day in this TMDL.

5.3 Load Allocation:
Since chlordane and PCBs were banned, there will be only minor and/or infrequent application of chlordane anywhere that might be discharged under runoff conditions and enter the river. As time passes, this, too, will decline. Therefore, the LA is set as zero pounds/day in this TMDL.

5.4 Margin of Safety:
In order to ensure there is no threat of chlordane and PCB levels impairing fish consumption, fish advisories will remain in effect until all samples taken from fish have met the desired endpoint for two years. The department will coordinate with DHSS in guarding against threats to human health associated with fish consumption from these two contaminants.

5.5 Seasonal Variation:
There is no seasonal variation associated with this TMDL.

6. Implementation

Since chlordane and PCBs have been banned, there is no specific remediation plan for this impairment. In regard to existing stores, stashes and unused inventory of these products, Missouri continues to collect them as they are turned in for proper disposal through various hazardous waste and hazardous household waste disposal initiatives. A major source of PCBs is transformers. Transformer fluid is tested and properly disposed of as the transformer ends its useful life.

Otherwise, fish tissue concentrations are declining as chlordane and PCBs are purged or degraded in water body sediments over time. Figures 3 and 4 show the average annual chlordane and PCB concentrations and their corresponding moving average trends.

Figure 3: Average Annual Chlordane Concentration (as Sum-of-the-Isomers) and Three-Year Moving Average in Missouri River over Time

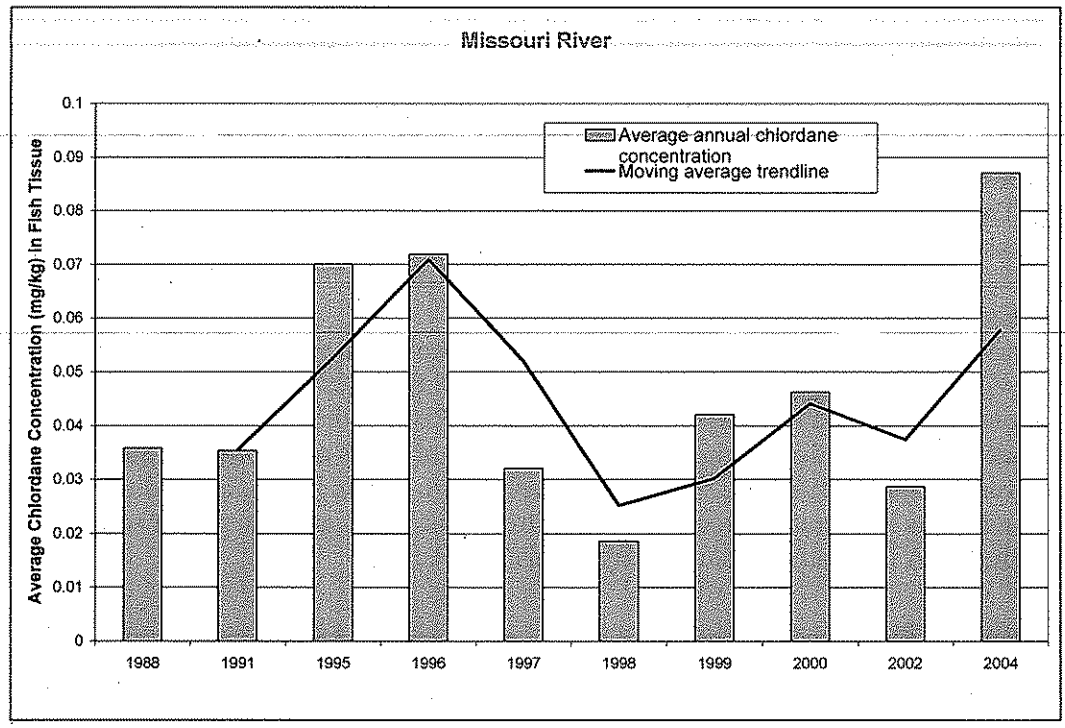
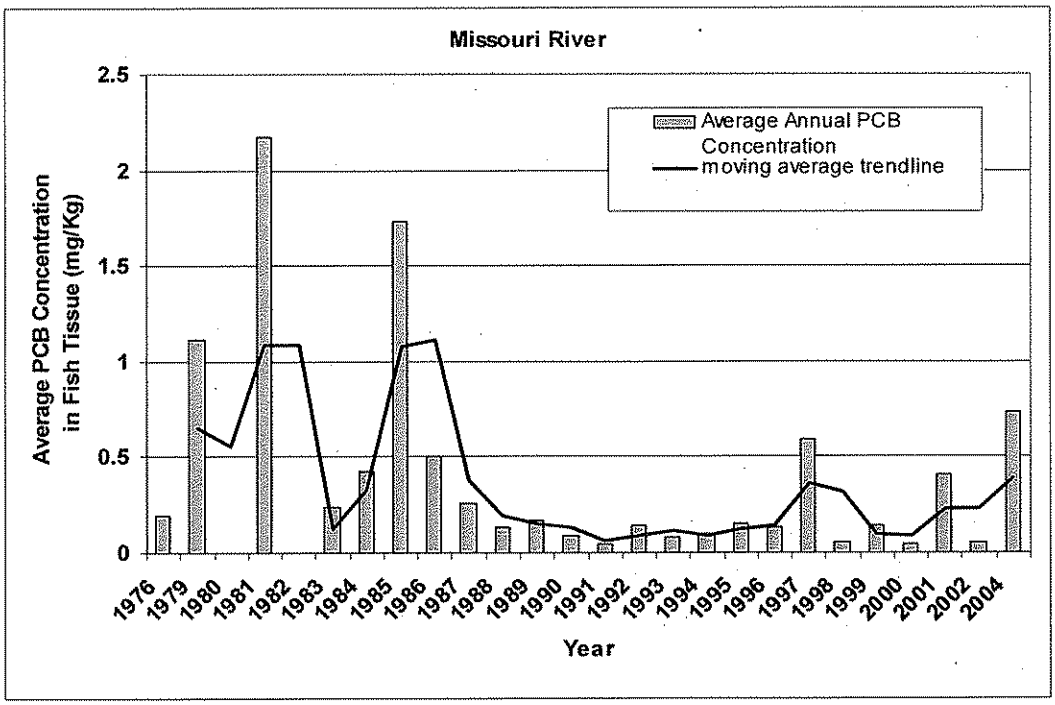


Figure 4: Average Annual PCB Concentration and Three-Year Moving Average in Missouri River over Time



The department recognizes that data collected to date do not always reflect a downward trend of PCBs or chlordane on a year-to-year basis; however, that this is most likely due to collection inconsistencies. Some years of data contain tissue samples of many different fish species, but some years contain only one or two species of fish. Fatty fish, such as carp, tend to absorb more PCBs than a less fatty fish such as catfish. Likewise, feeding habits, rainfall and age and size of the fish can effect the amount of sediment (thus PCBs and chlordane) assimilated by fish or the bio-accumulative effect. The most recent data predominately sampled catfish and sturgeon, however in 2004, only sturgeon was sampled. This would tend to show increasing levels of PCBs and chlordane in later years and obscure the overall downward trend. When only fillets are considered, from the year 2000 to the present, concentrations of both compounds are consistently below the stated action levels.

As mentioned, these pollutants degrade slowly and are extremely persistent in the environment. However, since they are no longer produced, a downward trend is inevitable and this TMDL recommends development of a consistent protocol for measurement of the pollutants in fish tissue and continued sampling.

This is a phased TMDL, which means that if future data indicates fish tissue chlordane and PCB levels are not continuing to decline, this TMDL will be re-evaluated. This TMDL will be incorporated into Missouri's Water Quality Management Plan.

7. Public Participation

This TMDL was on public notice from June 9 to July 9, 2006. Due to comments received during the first notice period, which resulted in substantial changes to the TMDL document, a second public notice period is appropriate. This period is from Aug. 30 to Sept. 29, 2006. Groups who receive the public notice announcement include the Missouri Clean Water Commission, the Water Quality Coordinating Committee, the water quality departments in neighboring states where the Missouri River is a shared border (Kansas and Nebraska), the 155 Stream Team volunteers in the watershed, and the 51 legislators representing all the counties bordering this river. Also, the department posts the notice, the Missouri River Information Sheet and this document on its Web site, making them available to anyone with access to the Web. The department will place a copy of the notice, any comments received and its responses in the Missouri River file.

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Appendix

Table A: Sampling Locations along Missouri River

Table B: Missouri River Fish Tissue Data

Table A: Sampling Locations along Missouri River

Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
1	Missouri River	Rulo, Nebraska	RM 498	40.0394	-95.4144	NDEQ
2	Missouri River	below Nodaway River, Missouri	RM 462.6	39.9003	-94.96022	MDC
3	Missouri River	Nodaway Island Access, Missouri	RM 462.1	39.9013	-94.9531	MDC
4	Missouri River	St. Joseph, Missouri	RM 448.2	39.754	-94.858	EPA/MDNR USEPA MDC
5	Missouri River	Leavenworth, Kansas	RM 397	39.3291	-94.9085	USEPA MDC USGS
6	Missouri River	Kansas City, Missouri	RM 365.8	39.1194	-94.534	EPA/MDNR USEPA MDC USGS
7	Missouri River	below I-635, Missouri	RM 374	39.1531	-94.6495	USEPA MDC
8	Missouri River	below US 169, Missouri	RM 365.9	39.113	-94.586	USEPA
9	Missouri River	above Hwy 269, Missouri	RM 363	39.1387	-94.5424	USEPA
10	Missouri River	above I-435, Missouri	RM 361	39.1515	-94.5117	USEPA
11	Missouri River	below Blue Ridge Blvd., Missouri	RM 358	39.1291	-94.4686	USEPA EPA/MDNR MDC
12	Missouri River	near Shoal Creek, Missouri	RM 351.8	39.168	-94.3723	USEPA MDC
13	Missouri River	Napolean, Missouri	RM 329.2	39.1342	-94.0645	MDC
14	Missouri River	Lexington, Missouri	RM 317.3	39.1869	-93.8965	EPA/MDNR USEPA MDC
15	Missouri River	near Malta Bend, Missouri	RM 275.3	39.2382	-93.3614	MDC
16	Missouri River	Miami, Missouri	RM 262.7	39.3289	-93.2252	MDC
17	Missouri River	Glasgow, Missouri	RM 226.5	39.2223	-92.8505	MDC
19	Missouri River	Boonville, Missouri	RM 196.7	38.9812	-92.7456	MDC

Table A: Sampling Locations along Missouri River

Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
19	Missouri	near Columbia,	RM 185	38.9597	-92.545	EPA/MDNR
20	Missouri River	Jefferson City, Missouri	RM 143.2	38.5875	-92.1788	USEPA MDC
21	Missouri River	Mokane, Missouri	RM 123.4	38.6519	-91.8831	MDC
22	Missouri River	Hermann, Missouri	RM 97.9	38.71	-91.4391022	EPA/MDNR MDC USGS
23	Missouri River	Weldon Springs CA, Missouri	RM 44.1	38.6565	-90.7332	MDC
24	Missouri River	Chesterfield, Missouri	RM 39	38.6874	-90.6627	USPHS MDC
25	Missouri River	St. Charles, Missouri	RM 28.2	38.7984	-90.4662	MDC

Table B: Missouri River Fish Tissue Data for Sum of the Isomers (SOI) of Chlordane and PCBs from 1976 to 2004

Note: For use in calculations, the original data were adjusted as follows: Where the data were recorded as "less than" values, half that value is used. Where data were recorded as "Trace amount", zero (0) is used. The SOI Chlor and PCB columns below reflect these adjustments. The units for both are milligrams per kilogram (mg/kg).

Org	Site	WBID	Site Name	Date	Species	County	Type	# in sample	SOI Chlor	PCB
MDC	701/92.2	701	Missouri R. @ Boonville	1976	CAT	COOPER		6		0.81
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	MIXED	COLE				0.462
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	RED	COLE		1		0.161
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	FH CAT	COLE		1		0
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	G EYE	COLE		1		0.448
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	CARP	BUCHANAN		1		0.12
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	G EYE	BUCHANAN		4		0.281
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	S GAR	BUCHANAN		1		0.086
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	CARPSU	BUCHANAN		3		0.166
USEPA	u	356	MO R. KC	1976	CARP			1		0.344
USEPA	u	356	MO R. KC	1976	G SHAD			3		0.751
USEPA	u	356	MO R. KC	1976	BUF			2		0.121
USEPA	u	356	MO R. KC	1976	B CRA			1		0
USGS	1604/97.9	1604	Missouri R. @ Hermann	1979	SM BUF	GASCONADE	W	1		0.9
USGS	1604/97.9	1604	Missouri R. @ Hermann	1979	CARPSU	GASCONADE	W	1		2.2
USGS	1604/97.9	1604	Missouri R. @ Hermann	1979	CARPSU	GASCONADE	W	1		1.7
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1980	B BUF	GASCONADE	W	5		0
EPA/MDNR	226/80.5	226	Missouri R.@ St. Joseph, Mo.	1980	CARP	BUCHANAN	W	5		0
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1981	CARP	GASCONADE	W	5		0

USEPA	226/30.1	226	Missouri R. @ Leavenworth, KS	1981	CARP	PLATTE	W	5	0
USEPA	356/77.4	356	Missouri R. @ Lexington	1981	CARP	LAFAYETTE	W	5	0
USEPA	356/77.4	356	Missouri R. @ Lexington	1981	CARP	LAFAYETTE	W	3	0
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1981	CARP	BUCHANAN	W	5	0
EPA/MDNR	u	356	MO R. KC	1981	CARP		W	5	0
USEPA	u	356	MO R. KC	1981	CARP		W	5	0
USEPA	u	356	MO R. KC	1981	CARP		W	6	22.3
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1982	B BUF	GASCONADE	W	5	0
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1982	CARP	BUCHANAN	W	5	0
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1983	CARP	GASCONADE	W	3	0.24
USEPA	226/30.1	226	Missouri R. @ Leavenworth, KS	1983		PLATTE	W		0
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1983		BUCHANAN	W		0
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1983	CARP	BUCHANAN	W	5	0
EPA/MDNR	u	356	MO R. KC	1983	CARP		W	6	0
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1984	CARP	GASCONADE	W	1	0.054
EPA/MDNR	356/77.4	356	Missouri R. @ Lexington	1984	CARP	LAFAYETTE	W	5	0
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	CH CAT	BOONE	F	20	0.077
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	CARPSU	BOONE	F	20	0.254
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	FH CAT	BOONE	F	20	0.095
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	SHSTUR	BOONE	F	20	2.52
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	CARP	BOONE	F	14	0.058
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1984	CARP	BUCHANAN	W	7	0
EPA/MDNR	u	356	MO R. KC	1984	CARP		W	5	2.11
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1985	CARP	GASCONADE	W	3	0.159
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1985	CARP	GASCONADE	W	3	0.285
EPA/MDNR	356/77.4	356	Missouri R. @ Lexington	1985	CARP	LAFAYETTE	W	5	0.53
EPA/MDNR	356/77.4	356	Missouri R. @ Lexington	1985	CARP	LAFAYETTE	W	5	0
EPA/MDNR	u	356	MO R. KC	1985	CARP		W	4	5.11
EPA/MDNR	u	356	MO R. KC	1985	CARP		W	3	7.49
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1986	CARP	GASCONADE	W	6	0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	CH CAT	BOONE	F		0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	BUF	BOONE	F		0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E		1.807
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	CARP	BOONE	F		0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F		0.551
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E		1.039
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E		1.512
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E		1.131
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E		2.363
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	W BASS	BOONE	F		0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F		1.265
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F		0.493
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	CARPSU	BOONE	F		0.356
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	DRUM	BOONE	F		0.123
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F		0.578
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F		0.316
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1986	CARP	BUCHANAN	W	5	0.13
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1986	CARP	BUCHANAN	W	5	0.13
EPA/MDNR	u	356	MO R. KC	1986	CARP		W	5	1.225
EPA/MDNR	u	356	MO R. KC	1986	CARP		W	5	2.165
MDC	u	356	MO R. KC	1986	CARP		F	5	0
MDC	u	356	MO R. KC	1986	CH CAT		F	5	0
MDC	701/92.2	701	Missouri R. @ Boonville	1987	FH CAT	COOPER	F	1	0.274
MDC	701/92.2	701	Missouri R. @ Boonville	1987	FH CAT	COOPER	F	5	0.09
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	5	0.205
R	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	5	0.092
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	5	0.071
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	1	0.245

MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARP	COOPER	F	5	0.07
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARP	COOPER	F	5	0.093
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARP	COOPER	F	1	0.09
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARPSU	COOPER	F	5	0.068
MDC	701/92.2	701	Missouri R. @ Boonville	1987	SHSTUR	COOPER	F	6	0.303
MDC	701/92.2	701	Missouri R. @ Boonville	1987	DRUM	COOPER	F	5	0.019
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	BM BUF	ST LOUIS	F	5	0.025
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	FH CAT	ST LOUIS	F	3	0.025
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	CARP	ST LOUIS	F	5	0.025
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	BL CAT	ST LOUIS	F	3	0.121
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	CH CAT	ST LOUIS	F	3	0.081
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	CARP	ST LOUIS	F	5	0.025
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1987	CARP	GASCONADE	W	2	0.122
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	FH CAT	PLATTE	F	5	0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	1	0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	4	0.036
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CH CAT	PLATTE	F	3	0.121
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	FH CAT	PLATTE	F	4	0.121
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	5	0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	5	0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	5	0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CH CAT	PLATTE	F	5	0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	FH CAT	PLATTE	F	5	0.053
MDC	356/77.4	356	Missouri R. @ Lexington	1987	CH CAT	LAFAYETTE	F	5	0.025
MDC	356/77.4	356	Missouri R. @ Lexington	1987	SM BUF	LAFAYETTE	F	1	0.025
MDC	356/77.4	356	Missouri R. @ Lexington	1987	FH CAT	LAFAYETTE	F	5	0.055
MDC	356/77.4	356	Missouri R. @ Lexington	1987	CARP	LAFAYETTE	F	5	0.139
USEPA	356/124.2	356	Missouri R. ab. Hwy. 269	1987	CARP	JACKSON	W	3	0.54
USEPA	356/124.2	356	Missouri R. ab. Hwy. 269	1987	CARP	JACKSON	W	3	0.64
USEPA	356/122.2	356	Missouri R. ab. I-435	1987	CARP	JACKSON	W	3	0.702
USEPA	356/122.2	356	Missouri R. ab. I-435	1987	CARP	JACKSON	W	3	0.425
USEPA	356/119.2	356	Missouri R. bl. Blue R.	1987	CARP	CLAY	W	3	3.22
USEPA	356/119.2	356	Missouri R. bl. Blue R.	1987	CARP	CLAY	W	3	1.26
USEPA	226/6.7	226	Missouri R. bl. I-635	1987	CARP	PLATTE	W	3	0.63
USEPA	226/6.7	226	Missouri R. bl. I-635	1987	CARP	PLATTE	W	3	0.63
USEPA	356/127.2	356	Missouri R. bl. US 169	1987	CARP	JACKSON	W	4	0.673
USEPA	356/127.2	356	Missouri R. bl. US 169	1987	CARP	JACKSON	W	5	0.395
USEPA	356/112.7	356	Missouri R. nr. Shoal Cr.	1987	CARP	CLAY	W	3	0.225
USEPA	356/112.7	356	Missouri R. nr. Shoal Cr.	1987	CARP	CLAY	W	3	0.215
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1987	CARP	BUCHANAN	W	4	0.18
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1987	CARP	BUCHANAN	W	4	0.279
EPA/MDNR	u	356	MO R. KC	1987	CARP		W	3	3
MDC	u	356	MO R. KC	1987	DRUM		F	5	0.025
MDC	u	356	MO R. KC	1987	FH CAT		F	3	0.025
EPA/MDNR	u	356	MO R. KC	1987	CARP		W	3	1.335
MDC	u	356	MO R. KC	1987	CH CAT		F	4	0.025
MDC	u	356	MO R. KC	1987	CH CAT		F	4	0.092
MDC	u	356	MO R. KC	1987	SHSTUR		F	1	0.17
MDC	u	356	MO R. KC	1987	BM BUF		F	5	0.025
MDC	u	356	MO R. KC	1987	SM BUF		F	5	0.025
MDC	u	356	MO R. KC	1987	CARPSU		F	5	0.092
MDC	u	356	MO R. KC	1987	CARP		F	5	0.053
MDC	u	356	MO R. KC	1987	CARP		F	5	0.095
MDC	u	356	MO R. KC	1987	CARP		F	5	0.079
MDC	u	356	MO R. KC	1987	CH CAT		F	3	0.025
MDC	u	356	MO R. KC	1987	FH CAT		F	4	0.025
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1988	CH CAT	GASCONADE	W	4	0.31
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	CARP	PLATTE	W	5	0.03

USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	G EYE	PLATTE	W	5		0.72
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	G SHAD	PLATTE	W	5		0.03
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	SHSTUR	PLATTE	W	5		0.7
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	CH CAT	PLATTE	W	3		0.3
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CARP		F	5	0.049	0
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CH CAT		F	3	0.052	0.081
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CH CAT		F	3	0.013	0.43
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CH CAT			3	0.03	0
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1988	CARP	CLAY	W	4		0.088
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1988	CARP	BUCHANAN	W	5		0.155
USGS	u	356	MO R. KC	1988	CARP		W	5		0.55
USGS	u	356	MO R. KC	1988	DRUM		W	5		0.62
USGS	u	356	MO R. KC	1988	CH CAT		W	5		0.33
MDC	701/92.2	701	Missouri R. @ Boonville	1989	CARP	COOPER	F	5		0.165
MDC	701/92.2	701	Missouri R. @ Boonville	1989	CH CAT	COOPER	F	5		0.111
MDC	701/92.2	701	Missouri R. @ Boonville	1989	FH CAT	COOPER	F	3		0.025
MDC	1604/97.9	1604	Missouri R. @ Hermann	1989	CH CAT	GASCONADE	F	5		0.133
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1989	CARP	GASCONADE	W	1		0.231
MDC	1604/97.9	1604	Missouri R. @ Hermann	1989	CARP	GASCONADE	F	3		0.127
MDC	1604/97.9	1604	Missouri R. @ Hermann	1989	CARP	GASCONADE	F	2		0.131
MDC	701/39.5	701	Missouri R. @ Jefferson City	1989	CH CAT	COLE	F	5		0.072
MDC	701/39.5	701	Missouri R. @ Jefferson City	1989	CARP	COLE	F	5		0.093
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1989	CH CAT	PLATTE	F	5		0.173
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1989	CARP	PLATTE	F	5		0.025
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1989	CARP	ST CHARLES	F	5		0.151
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1989	CH CAT	ST CHARLES	F	3		0.161
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1989	CARP	CLAY		5		1.82
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CH CAT	BOONE	F	5		0.025
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	SHSTUR	BOONE	F	5		0.078
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CARP	BOONE	F	2		0.087
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CARP	BOONE	F	3		0.025
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CH CAT	BOONE	F	2		0.025
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1989	CH CAT	CLAY		5		0.082
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1989	CARP	CLAY		5		0.056
EPA/MDNR	226/80.5	226	Missouri R.@ St. Joseph, Mo.	1989	CARP	BUCHANAN	W	4		0.167
MDC	701/92.2	701	Missouri R. @ Boonville	1990	CARP	COOPER	F	5		0.1
MDC	701/92.2	701	Missouri R. @ Boonville	1990	CH CAT	COOPER	F	5		0.025
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1990	CARP	GASCONADE	W	3		0.367
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	SHSTUR	GASCONADE	F	5		0.285
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	CARP	GASCONADE	F	5		0.106
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	PADDLE	GASCONADE	F	1		0.025
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	CH CAT	GASCONADE	F	5		0.192
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	PADDLE	GASCONADE	F	1		0.025
MDC	701/39.5	701	Missouri R. @ Jefferson City	1990	CARP	COLE	F	5		0.025
MDC	701/39.5	701	Missouri R. @ Jefferson City	1990	CH CAT	COLE	F	5		0.084
MDC	226/6.7	226	Missouri R. bl. I-635	1990	FH CAT	PLATTE	F	5		0.025
MDC	226/6.7	226	Missouri R. bl. I-635	1990	CARP	PLATTE	F	5		0.025
MDC	356/36.4	356	Missouri R. nr. Malta Bend	1990	CARP	SALINE		5		0.091
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1990	CARP	CLAY	F	5		0.124
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1990	CH CAT	CLAY	F	5		0.079
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1990	CARP	BUCHANAN	W	5		0.355
MDC	701/121.9	701	Missouri R. @ Glasgow	1991	CH CAT	HOWARD				0
NDEQ	226/NE		Missouri R. @ Rulo, NE	1991	CH CAT		F	5	0.035	0
NDEQ	226/NE		Missouri R. @ Rulo, NE	1992	CH CAT		F	4		
NDEQ	226/NE		Missouri R. @ Rulo, NE	1992	CH CAT		F	4		
NDEQ	226/NE		Missouri R. @ Rulo, NE	1992	CH CAT		F	4		
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1992	CARP	CLAY		1		
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1993	CARP	GASCONADE	W	2		0.05

EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1993	CARP	BUCHANAN	W	3		0.23
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1994	CARP	CLAY	F	18		0.025
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1994	CARP	CLAY	F	18		0.161
USGS-BEST	1604/97.9	1604	Missouri R. @ Hermann	1995	BASS	GASCONADE	W	17	0.05	0.05
USGS-BEST	1604/97.9	1604	Missouri R. @ Hermann	1995	CARP	GASCONADE	W	15	0.09	0.3
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1995	CARP	CLAY	W	5		0.443
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1995	CARP	BUCHANAN	W	5		0.079
NDEQ	226/NE		Missouri R. @ Rulo, NE	1996	CH CAT		F	5	0.03	0.093
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	SHSTUR	ST CHARLES	F	13	0.113	0.025
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	SHSTUR	ST CHARLES	E		0.105	0.025
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	CARP	ST CHARLES	F	23	0.066	0.112
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	CH CAT	ST CHARLES	F	24	0.054	0.065
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CARP	BOONE	F	14	0.054	0.079
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	BUF	BOONE	F	15	0.073	0.131
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	SHSTUR	BOONE	F	25	0.018	0.23
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CARP	BOONE	F	14	0.059	0.074
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CARP	BOONE	F	17	0.053	0.084
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	BUF	BOONE	F	10	0.066	0.025
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	SHSTUR	BOONE	E	5	0.096	0.354
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CH CAT	BOONE	F	25	0.073	0.059
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	F	7	0.039	0.183
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	CH CAT	BUCHANAN	F	25	0.019	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	CARP	BUCHANAN	F	17	0.017	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	E		0.188	0.586
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	CARP	BUCHANAN	F	28	0.032	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	BUF	BUCHANAN	F	6	0.077	0.102
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	BUF	BUCHANAN	F	11	0.054	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	F	13	0.038	0.099
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	E		0.299	0.698
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1997	CARP	CLAY	W	4		1.56
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1997	CARP	CLAY	W	3		1.26
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1997	CARP	BUCHANAN	F	25	0.04	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1997	CH CAT	BUCHANAN	F	15	0.024	0.025
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1997	CARP	BUCHANAN	W	4		0.092
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	1998	CARP	ST LOUIS	F	25	0.032	0.083
MDC	701/80.7	701	Missouri R. nr. Columbia	1998	FH CAT	BOONE		15	0.005	0.02
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1999	CARP	CLAY	W	5		0.126
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1999	CARP	CLAY	W	5		0.22
MDC	701/80.7	701	Missouri R. nr. Columbia	1999	CARP	BOONE	F	25	0.042	0.025
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1999	CARP	BUCHANAN	W	5		0.187
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2000	FH CAT	ST CHARLES	F	16	0.016	0.053
MDC	226/93.4	226	Missouri R. bl. Nodaway R.	2000	CH CAT	ANDREW		15	0.009	0.009
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2000	CARP	BUCHANAN	F	10	0.092	0.029
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2000	CARP	BUCHANAN	F	15	0.04	0.022
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	2001	CARP	CLAY	W	5		0.802
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2001	CARP	BUCHANAN	W	5		0.154
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2001	CARP	BUCHANAN	W	5		0.262
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2002	CARP	ST CHARLES	F	15	0.04	0.052
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2002	FH CAT	ST CHARLES	F	17	0.028	0.077
MDC	701/80.7	701	Missouri R. nr. Columbia	2002	CARP	BOONE	F	26	0.018	0.028
MDC	356/23.4	356	Missouri R. @ Miami	2004	SHSTUR	SALINE	F	5	0.037	0.229
MDC	356/23.4	356	Missouri R. @ Miami	2004	SHSTUR	SALINE	F	5	0.024	0.278
MDC	356/23.4	356	Missouri R. @ Miami	2004	SHSTUR	SALINE	F	5	0.018	0.165
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.105	1.14
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.144	1.52
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	F	5	0.025	0.393

MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	F	5	0.049	0.346
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	F	5	0.093	0.807
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.086	
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.056	0.454
MDC	356/87.7	356	Missouri R. @ Napoleon	2004	SHSTUR	LAFAYETTE		15	0.05	0.483
MDC	356/87.7	356	Missouri R. @ Napoleon	2004	SHSTUR	LAFAYETTE		6	0.39	4.01
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.133	0.889
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW		5	0.031	0.22
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW		5	0.022	0.23
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.193	0.532
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.077	0.758
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	F	5	0.038	0.422
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.14	0.867
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.103	0.726
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES		5	0.036	0.184
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	E	1	0.114	0.57
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	E	1	0.07	1.1
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	F	5	0.058	0.431
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	F	5	0.058	0.739
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	E	1	0.113	0.766
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	2005	C CARP	JACKSON		5		0.58
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2005	C CARP	BUCHANAN	W	5		0.049

Note: Site = WBID/number of miles from mouth; u = urban; r = rural; # in sample = the number of fish in each "sample".
Type = what form of the fish is evaluated:

W = the whole fish
F = the fillet of the fish only
E = the fish eggs only

Section

2

STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

Mr. John DeLashmit
U.S. Environmental Protection Agency
Region VII
901 North Fifth Street
Kansas City, KS 66101

RE: Submittal of Total Maximum Daily Loads for the Mississippi River (WBIDs 1, 1707 and 3152) and the Missouri River (WBIDs 226, 356, 701 and 1604)

Dear Mr. DeLashmit:

Enclosed please find copies of the Total Maximum Daily Loads (TMDLs) for the Mississippi and Missouri Rivers.

We have received and reviewed your comments on the draft TMDL documents and have edited them appropriately. These TMDLs were first public noticed from June 9, 2006 to July 9, 2006. Public comments were received and substantial adjustments to the TMDLs were needed. The documents were again placed on public notice from August 30, 2006 to September 29, 2006. No comments were received during this notice. All comments received and Missouri Department of Natural Resources' response letters are enclosed. We now submit these documents as final TMDLs for review and approval by the U.S. Environmental Protection Agency (EPA) pursuant to Section 303(d)(2) of the Federal Clean Water Act.

The Mississippi River and the Missouri River TMDLs were developed by the department's Water Protection Program to address the chlordane and polychlorinated biphenyl (PCB) impairments of these waters, as identified on the 2002 Section 303(d) list. These impairments arose from chlordane used in the past as an insecticide and PCBs used in various industries. Both compounds have been banned and their concentrations in these waterbodies have been declining. Therefore, no further action, besides periodic monitoring, will be taken unless concentration levels rise above the action limits of 0.1 mg/kg for chlordane and 2.0 mg/kg for PCBs.

We appreciate EPA taking prompt action on these TMDLs. If you have any questions, please contact Ms. Anne Peery by phone at (573) 526-1426 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM

Edward Galbraith
Director

EG:apl

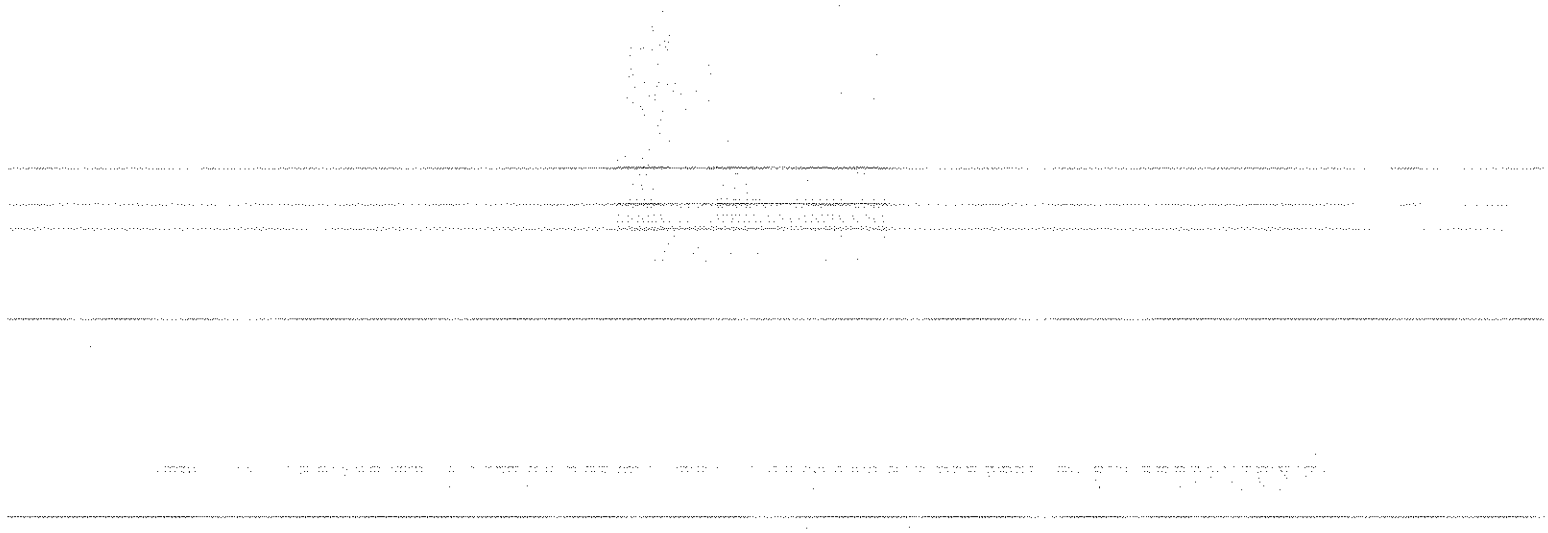
Enclosure

c: Mr. Daniel R. Schuette, Director, DEQ
Mr. Earl Pabst, Deputy Director, DEQ
Missouri Clean Water Commission

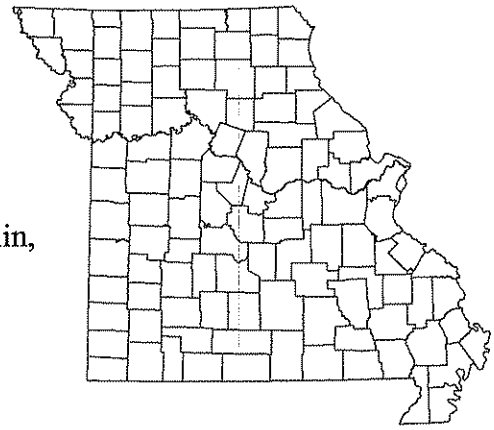
Missouri Department of Natural Resources
Water Protection Program

Total Maximum Daily Loads (TMDLs)
for
Chlordane and Polychlorinated Biphenyls
in the
Missouri River

Completed: October 5, 2006
Approved:



Total Maximum Daily Loads (TMDLs)
For the Missouri River
Pollutants: Chlordane and Polychlorinated Biphenyls (PCBs) in Fish Tissue



Name: Missouri River

Location: Across 25 counties: Atchison, Holt, Andrew, Buchanan, Platte, Clay, Jackson, Ray, Lafayette, Carroll, Saline, Chariton, Howard, Cooper, Moniteau, Boone, Cole, Callaway, Osage, Montgomery, Gasconade, Warren, Franklin, St. Charles and St. Louis

Hydrologic Unit Codes (HUC): 10240001, 10240005, 10240011, 10300101, 10300102, 10300200

Water Body Identification Numbers (WBID): (from the mouth at St. Louis to the Iowa border)1604 (100 miles), 701 (129 miles), 356 (125 miles) and 226 (179 miles)

Missouri Steam Classification: The Missouri River is classified in the Missouri Water Quality Standards (WQS) as a Class P[1] stream

Beneficial Uses for Missouri River[2]:
- Livestock and Wildlife Watering
- Protection of Aquatic Life and Human Health – Fish Consumption
- Whole Body Contact Recreation, Category B
- Secondary Contact Recreation
- Irrigation
- Drinking Water Supply
- Industrial

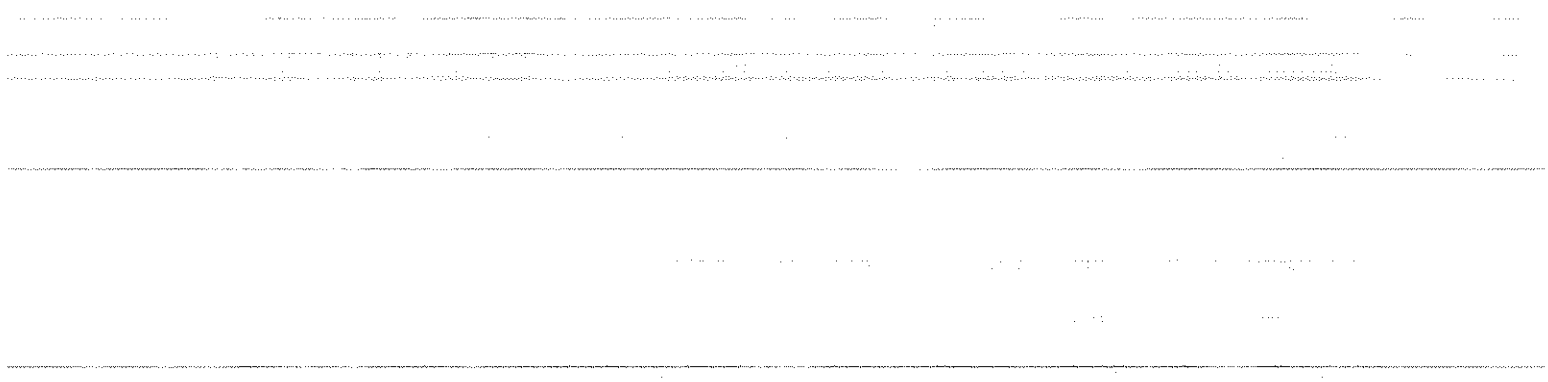
Pollutant: Chlordane and PCBs in fish tissue

Size of Impaired Segment: 533 miles

Pollutant Source: Many point and nonpoint sources

TMDL Priority Ranking: High

[1] Class P streams maintain permanent flow even in drought periods
[2] For beneficial uses see 10 CSR 20-7.0310(C) and Table (H)



1. Introduction

1.1 Study Area Description:

The Missouri River is 2,565 mile long starting at its headwaters in the Jefferson, Madison and Gallatin Rivers, which converge near Three Forks, Montana, to form the Missouri River. The river flows north through mountainous canyons before emerging from the mountains near Great Falls, Montana. It flows east across the plains of Montana into North Dakota, then turns southeast flowing into South Dakota and along the north and eastern edge of Nebraska. The river forms part of Nebraska's border with South Dakota and nearly its entire boundary with Iowa, flowing past Sioux City and Omaha. The river forms the entire boundary between Nebraska and Missouri and part of the boundary between Missouri and Kansas. At Kansas City, the river turns eastward and flows across Missouri where it joins the Mississippi River just north of St. Louis. The Missouri River sub-basin is the largest sub-basin in the Mississippi River basin, covering more than 500,000 square miles.

The TMDL discussed in this report is for the portion of the Missouri River that begins on the border of Iowa and Missouri, approximately 10 miles north of Watson, Missouri, at River Mile 552 (Figure 1). Table A in the appendix provides a detailed description of the 25 sampling locations along the Missouri River shown in Figure 1. Land use for this 533-mile portion[3] of the Missouri River is shown in Figure 2. Within the impaired segments, three major tributaries enter the Missouri River. These tributaries are the Platte, Blue and Osage Rivers, and their confluences are at Missouri River Miles 391, 358 and 133, respectively. Table 1 summarizes the information on the impaired segments in the Missouri River based on the 2002 303(d) listing.

Table 1: Missouri 2002 303(d) List for Impaired Segments in Missouri River

WBID	Waterbody	Size	Unit	Pollutant	Downstream County	Upstream County	Priority
1604	Missouri River	100	Miles	Chlordane, PCBs	St. Louis	Gasconade	High
701	Missouri River	129	Miles	Chlordane, PCBs	Gasconade	Chariton	High
356	Missouri River	125	Miles	Chlordane, PCBs	Chariton	Jackson	High
226	Missouri River	179	Miles	Chlordane, PCBs	Jackson	Atchison	High

[3] There is a 19-mile discrepancy between the length of the river (from the Iowa state line to the Mississippi) as recorded in the WQS vs. the mile marker on the river itself at the Iowa line. This amounts to a 3.4 percent difference, which is well within the acceptable standard deviation. However, as ArcView becomes more accurate, the river will be re-measured and in due time this will be reflected in the WQS.

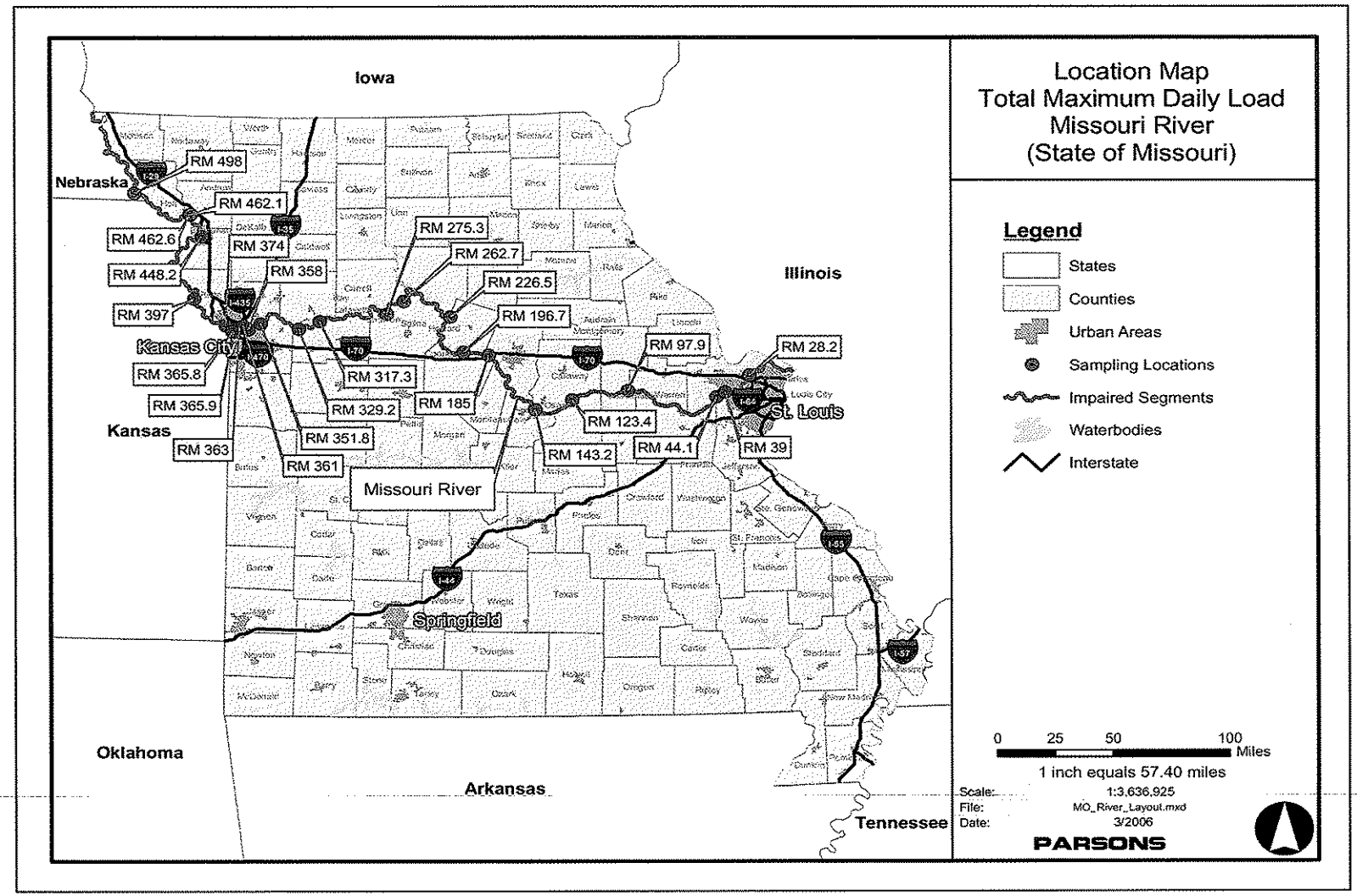
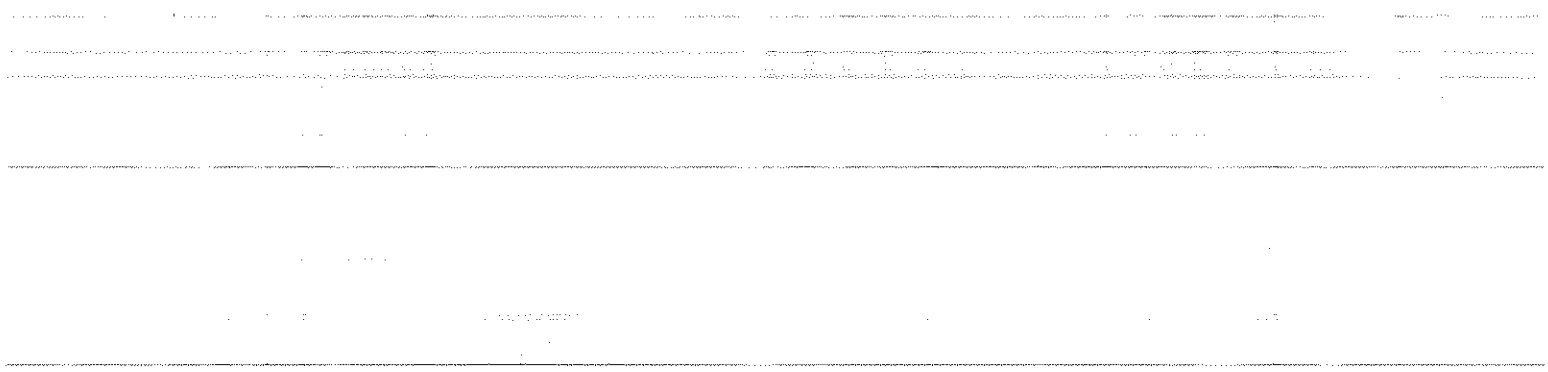


Figure 1: Location Map for Impaired Segments in Missouri River



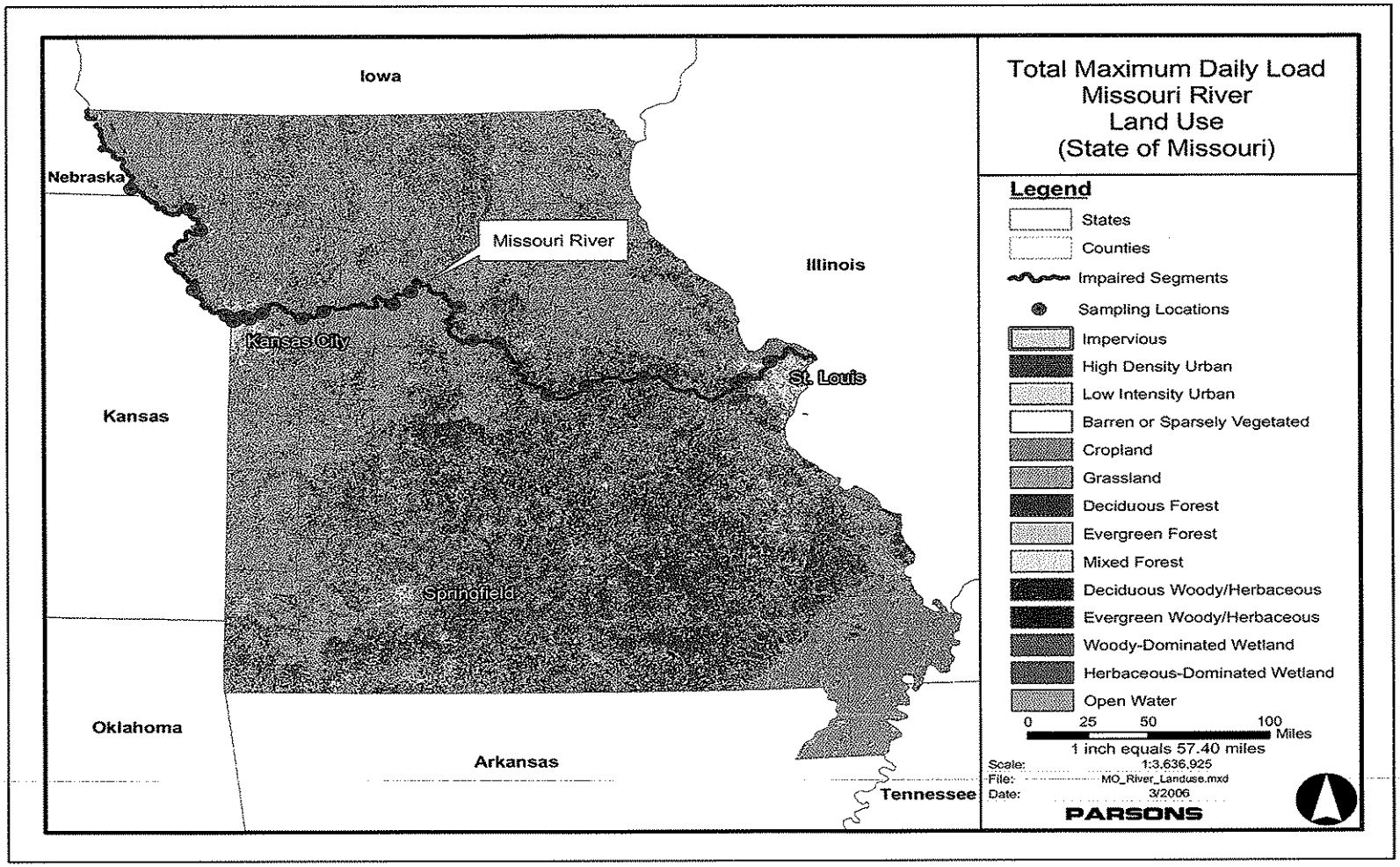


Figure 2: Land Use for Missouri River Watershed within State of Missouri

1.2 Fish Advisories in Missouri:

The Missouri Department of Conservation (MDC) has monitored levels of toxic contaminants in fish from Missouri lakes and rivers since 1984. At that time, MDC discovered elevated levels of chlordane in fish in the Missouri, Mississippi and Meramec rivers. MDC, the U.S. Environmental Protection Agency (EPA) and the department all provide fish tissue sample results to the Missouri Department of Health and Senior Services (DHSS) for use in determining health risks to fish consumers. DHSS, in turn, issues fish consumption advisories. DHSS has issued advisories based on pesticide contaminants in fish since 1985. Past DHSS fish advisories instructed anglers to limit consumption of fatty fish (carp, catfish, buffalo, drum, suckers and paddlefish) to one meal per week. This advisory was rescinded in 2001. Trout also have a high level of fat, but are considered safe to eat from anywhere in the state. In 2002, sturgeon eggs were added to the only existing PCB advisory, which has been in place for sturgeon meat from the Missouri River since 1997.

DHSS issues its fish advisory every year around March or April. The advisory is made available to the public through press releases and may be accessed by calling DHSS at 1-866-628-9891. These advisories are also distributed to all Missouri county health departments and are posted on the Internet. The 2006 advisory may be found at www.dhss.mo.gov/NewsAndPublicNotices/06FishAdvisory.pdf.

2. Description of the Applicable Water Quality Standards

2.1 Beneficial or Designated Uses:

These uses are listed on page one. The use that is impaired is protection of warm water aquatic life and human health associated with fish consumption.

2.2 Anti-degradation Policy:

Missouri's WQS include EPA's "three-tiered" approach to anti-degradation and may be found at 10 CSR 20-7.031(2).

Tier 1 – Protects existing uses and provides the absolute floor of water quality for all waters of the United States. Existing instream water uses are those uses that were attained on or after Nov. 29, 1975, the date of EPA's first WQS regulation, or uses for which existing water quality is suitable unless prevented by physical problems such as substrate or flow.

Tier 2 – Protects the level of water quality necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water in waters that are currently of higher quality than required to support these uses. Before water quality in Tier 2 waters can be lowered, there must be an anti-degradation review consisting of: (1) a finding that it is necessary to accommodate important economical or social development in the area where the waters are located; (2) full satisfaction of all intergovernmental coordination and public participation provisions; and (3) assurance that the highest statutory and regulatory requirements for point sources and best management practices for nonpoint sources are achieved. Furthermore, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses.

Tier 3 – Protects the quality of outstanding national resources, such as waters of national and state parks, wildlife refuges and water of exceptional recreational or ecological significance. There may be no new or increased discharges to these waters and no new or increased discharges to tributaries of these waters that would result in lower water quality (with the exception of some limited activities that result in temporary and short-term changes in water quality).

2.3 Specific Criteria:

2.3.1 Chlordane

The specific criteria for chlordane are found in Missouri's Water Quality Standards, 10 CSR 20-7.031, Table A, under Persistent, Bioaccumulative, Man-made Toxics. The limit for chlordane *in water* related to human health protection associated with fish consumption is 0.00048 micrograms per liter (µg/L or parts per billion). However, elevated chlordane levels in water are not the problem. As chlordane tends to bioaccumulate in fish, this TMDL will be based on fish tissue chlordane levels. Fish tissue levels refer to the amount of chlordane in the fillet, or edible portion, of fish. The U.S. Food and Drug Administration (FDA) developed a fish tissue action level of 0.3 milligrams per kilogram (mg/kg or parts per million) for technical grade chlordane. Note: 1 kilogram equals approximately 2.2 pounds. However, the department and DHSS use the action level of 0.1 mg/kg sum-of-the-isomers of chlordane.[4] If the level of a toxic contaminant exceeds this action level or the unrestricted consumption level, a fish consumption limit advisory that provides a risk-based, safe consumption level for target populations is issued regarding the potential health risk associated with long-term consumption of contaminated fish.

2.3.2 PCBs

The specific criteria for PCBs are found in Missouri's WQS, 10 CSR 20-7.031, Table A, under Persistent, Bioaccumulative, Man-made Toxics. The limit for PCBs *in water* related to human health protection associated with fish consumption is 0.000045 µg/L. The FDA set a 2.0 mg/kg limit on PCBs in fish tissue for interstate shipment of fish for human consumption. DHSS currently uses this number to issue fish advisories related to PCBs and the department uses the same number to judge impairment of Missouri water bodies by PCBs. However, DHSS has a revised fish advisory methodology that follows EPA guidance, so the threshold value for PCBs will change. The new threshold value for unrestricted consumption is expected to be 0.04 mg/kg of total PCBs in fish tissue. Following adoption of these new guidelines by DHSS, the next state 303(d) listing methodology document will acknowledge them and may be revised accordingly.

[4] Data can be collected as technical chlordane or sum-of-the-isomers of chlordane, in which case the action level is 0.1 mg/kg. Sum-of-the-isomers of chlordane is usually comparable to FDA's action level of 0.3 mg/kg technical grade chlordane when the contamination is recent, because there is a lot of the technical chlordane still present. However, after a few years the comparison no longer works well. The department, MDC, EPA and DHSS quantify chlordane by summing the following four chlordane isomers: cis-chlordane, trans-chlordane, cis-nonachlor and trans-nonachlor.

3. Current Water Quality Condition and Desired Endpoint

3.1 Current Water Quality Condition:

Several agencies collected fish tissue samples at numerous monitoring sites along the Missouri River from 1976 to 2004. The goal of the fish tissue monitoring and survey program was to analyze fish tissue samples for chlordane and PCBs in order to define water body segments impacted by contamination. Bottom feeding fish such as carp were sampled because of their feeding or dwelling preferences near the bottom of the water column where chlordane and PCBs remain in the sediments.

Even though they have been banned, both chlordane and PCBs degrade very slowly, making them particularly persistent in the environment. They remain in the soil for long periods of time. Because these pollutants are not soluble they are not readily found in the water column. Instead they adsorb to soil particles in lakebed or streambed sediments. Bottom-feeding fish, such as carp, become exposed to chlordane and PCBs due to their feeding and dwelling preferences near streambeds or lakebeds where contaminated sediments persist. Fish uptake these pollutants in water through their gills and through the consumption of contaminated aquatic organisms. Once the pollutants are absorbed into the bloodstream, they accumulate primarily in fatty tissues. Once in the fatty tissues, the pollutants have the ability to biomagnify, or increase in concentration, as the compound is transferred through the food chain. These fish include fatty fish, such as carp, catfish, buffalo, drum, suckers and paddlefish.

3.2 TMDL Endpoint:

The department uses threshold levels of 0.1 mg/kg of chlordane (sum of isomers) and 2.0 mg/kg of total PCBs in fish tissue to determine support of the designated use. As just stated, because DHSS has a revised fish advisory methodology that follows EPA guidance, the threshold value for PCBs will change. The new threshold value for unrestricted consumption will be 0.04 mg/kg of total PCBs in fish tissue. If the average levels of these compounds exceed these levels in fillets of the fish sampled, the water body is considered to be not supporting the fish consumption use. These will be used for the endpoints for these TMDLs and the achievement of these targets should lead to the removal of fish consumption advisories. Missouri's protocol for removing or down grading an advisory requires at least two years of data below these targets.

4. Source Inventory and Assessment

4.1 Chlordane:

Chlordane has been identified as a pollutant of concern because it is a bio-accumulative pesticide that is carcinogenic and can cause both acute and chronic toxic effects. Its polycyclic chlorinated organic structure produces deleterious biological effects similar to those of DDT, PCBs and other related substances (MDE, 2000).

Chlordane is a manufactured chemical that was used as a pesticide in the U.S. from 1948 to 1988 (ATSDR, 1995). Since its introduction in the 1940s, chlordane was used as a broad-spectrum pesticide for agricultural, home and commercial control of insects until it was withdrawn from the

market in 1988. The original source of chlordane was runoff, particularly from urban areas where widespread termite eradication occurred around homes in the 1970s and 1980s. Chlordane was also used at nurseries, on golf courses and in agriculture. Chlordane was banned for agricultural use in 1975 and for all uses in 1988; therefore, no additional loading should occur. Some of its trade names include Oktachlor and Velsicol 1068 (ATSDR, 1995). At the height of production, chlordane was the second most widely used organochlorine insecticide in the U.S., with annual production of about 11 million kg/year. Production in the U.S. in 1974 amounted to 9.5 million kg (IPCS, 1988). Over 70,000 tons of chlordane has been manufactured since 1946 (U.S. EPA, 1998).

As previously mentioned, chlordane degrades very slowly, and thus is extremely persistent in the environment (with the ability to stay in the soil for over 20 years). It bio-accumulates in the tissue of bottom-feeding fish (such as carp) which become exposed to chlordane due to their feeding or dwelling preferences near chlordane-contaminated sediments. Eating fish contaminated by chlordane will not make a person immediately ill. However, over a long period of time, chlordane may damage the nervous system, digestive system and the liver (MDNR, 2001).

The department recognizes that there is still chlordane in products in storage sheds, barns and basements. It is possible that chlordane could still find its way into the environment through leaks, use of the product or improper disposal. However, it is estimated that the amount that might actually reach the river is negligible.[5] The reasons for this are: 1) since it has been banned since 1988, the number of people who still have a product containing chlordane is small, 2) chlordane would be only a small portion of the ingredients in the product, 3) The number of people who would use the product is smaller yet and 4) if applied according to directions, it should not cause a problem. Overall, there is no reason to expect that the levels of chlordane in the environment, and therefore chlordane levels in fish tissue, will do anything but decline in the future.

4.2 Polychlorinated Biphenyls (PCBs):

PCBs are a mixture of up to 200 different chlorinated compounds and are stable under conditions of high pressure and high temperature. PCBs are manmade compounds that have been used commercially since 1929. These chemicals were manufactured as combinations of chlorinated biphenyls that differed according to the percentage of chlorine in the mixture. PCBs had a wide variety of industrial applications due to their chemical stability and flame resistance. However, these characteristics also enabled them to remain highly persistent in the environment. PCBs were commonly used as plasticizers, heat-transfer fluids, solvent extenders, hydraulic fluids, flame retardants, sealers, ink carriers, organic diluents and dielectric fluids. They are found in transformers, capacitors, florescent lighting fixtures, televisions, computers, microscope oil, hydraulic oil, caulking compounds and elastic sealant made from 1966 to 1975. The manufacturing of PCBs stopped in the United States in 1977 due to concerns about the persistence of PCBs in the environment and evidence that they bioaccumulate, which can cause harmful health effects.

U.S. industry purchased approximately 1.25 billion pounds of PCBs by the time production stopped in 1977 (U.S. EPA, 1993). EPA estimates that 60 percent, or 750 million pounds, of PCBs produced are still in use in the U.S. in approximately 150,000 PCB transformers and 2.5 million mineral oil transformers (Graham, 1987). Another 36 percent (450 million pounds) of PCBs were

[5] Personnel correspondence with Paul Andre, Missouri Department of Agriculture, Pesticide Program, 7/06.

either placed in landfills or dumps or were available to biota via air, water, soil and sediments. The remaining four percent (55 million pounds) were destroyed by incineration or were degraded in the environment (U.S. EPA, 1993). Monsanto Chemical Company in Sauget, Illinois, produced approximately 99 percent of commercial PCBs for U.S. industry and sold the compounds under the trade name Aroclor (ATSDR, 1995a). A four digit numbering code identifies the Aroclors. The first two digits denote the number of carbon atoms in the biphenyl group and the last two digits represent the approximate percentage of chlorine in the mixture. The most common PCBs manufactured include Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260 (Cairns et. al., 1986).

The behavior of PCBs differs depending on the number of chlorine atoms present. Generally, these compounds are relatively insoluble and have the ability to absorb strongly into organic matter. As the chlorine content increases, the solubility of the compounds decrease and the mixture becomes more viscous. PCBs are highly lipophilic (fat loving) and bio-accumulate in fish tissue, which can result in very high concentrations that are unsafe for human consumption (U.S. EPA, 1980). Currently, the primary source of PCB ingestion is through the consumption of contaminated fish (USDHHS, 1995). Fish uptake of PCBs in water through their gills and through the consumption of contaminated aquatic organisms. As with chlordane, PCBs are absorbed into the bloodstream and accumulate primarily in fatty tissues. In these fatty tissues, they have the ability to biomagnify or increase in concentration, as the compound is transferred through the food chain. In humans and other mammals, PCBs accumulate in the gastrointestinal tract, adipose (fatty) tissue and skin.

As already stated, U.S. production of PCBs ended in 1977 because of the evidence that they accumulate in the environment, which can cause harmful health effects. Although production of PCBs was banned, note that the ban was on the manufacture, processing, and distribution in commerce of PCBs. The ban did not extend to existing products containing PCBs, such as transformers. Poorly maintained hazardous waste sites that contain PCBs, industrial and municipal incinerators burning organic waste, illegal or improper dumping of PCB wastes (such as transformer fluids and some capacitors) and leaks from electrical transformers continue to release PCBs into the environment. However, since PCBs are no longer produced, a downward trend in the environment is inevitable.

5. Determination of TMDL and Allocation[6]

The following equation was used to calculate the TMDL.

TMDL = WLA + LA + MOS (Eq. 1)

where:

TMDL: Total Maximum Daily Load
WLA: Waste Load Allocation (for point sources)
LA: Load Allocation (for non-point sources)
MOS: Margin of Safety (to account for uncertainties)

[6] Calculations and graphs by Parsons Corporation, a Pasadena-based engineering and construction firm

5.1 TMDL/Loading Capacity:
TMDL or loading capacity is defined as the maximum pollutant load that a water body can assimilate and still attain WQS. EPA banned the use of chlordane in 1988. While the department recognizes that there is still chlordane in existence that is unaccounted for, with the potential to enter the river system, the amount that might actually reach the river is believed to be negligible (see section 4.1). Again, there is no reason to expect that the levels of chlordane in the environment and in fish tissue will do anything but decline in the future. Therefore, the TMDL for chlordane in the 533 mile impaired segment along the Missouri River is set as zero pounds/day.

Similarly, EPA banned the use of PCBs in 1977. Again, the department acknowledges that there is the potential for a certain amount of PCBs to leak into the environment (see Source Inventory-PCBs above). However, judging from the available data, that amount is deemed to be small and declining. Therefore, the TMDL for PCBs in the 533 mile impaired segment along the Missouri River is set as zero pounds/day.

5.2 Waste Load Allocation:
As stated earlier, these two compounds are mainly a sediment issue and amounts in the water column are virtually non-detectable. There are no Missouri facilities which discharge either directly to the Missouri River or to a tributary where the Missouri River is the first classified water body, that have that potential for discharging detectable amounts of PCBs or chlordane. Since chlordane and PCBs were banned in 1988 and 1977, respectively, there should be negligible discharge of chlordane and PCBs into streams from wastewater treatment plants and other point sources. Therefore, the WLA is set as zero pounds/day in this TMDL.

5.3 Load Allocation:
Since chlordane and PCBs were banned, there will be only minor and/or infrequent application of chlordane anywhere that might be discharged under runoff conditions and enter the river. As time passes, this, too, will decline. Therefore, the LA is set as zero pounds/day in this TMDL.

5.4 Margin of Safety:
In order to ensure there is no threat of chlordane and PCB levels impairing fish consumption, fish advisories will remain in effect until all samples taken from fish have met the desired endpoint for two years. The department will coordinate with DHSS in guarding against threats to human health associated with fish consumption from these two contaminants.

5.5 Seasonal Variation:
There is no seasonal variation associated with this TMDL.

6. Implementation

Since chlordane and PCBs have been banned, there is no specific remediation plan for this impairment. In regard to existing stores, stashes and unused inventory of these products, Missouri continues to collect them as they are turned in for proper disposal through various hazardous waste and hazardous household waste disposal initiatives. A major source of PCBs is transformers. Transformer fluid is tested and properly disposed of as the transformer ends its useful life.

Otherwise, fish tissue concentrations are declining as chlordane and PCBs are purged or degraded in water body sediments over time. Figures 3 and 4 show the average annual chlordane and PCB concentrations and their corresponding moving average trends.

Figure 3: Average Annual Chlordane Concentration (as Sum-of-the-Isomers) and Three-Year Moving Average in Missouri River over Time

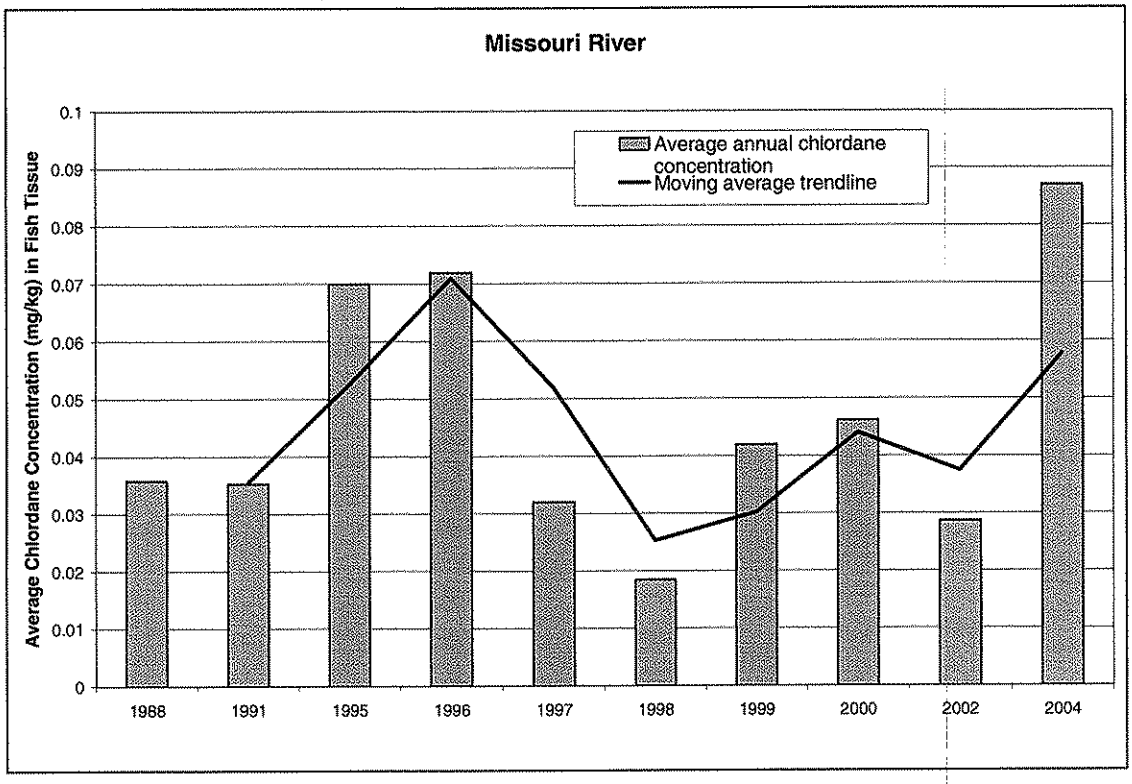
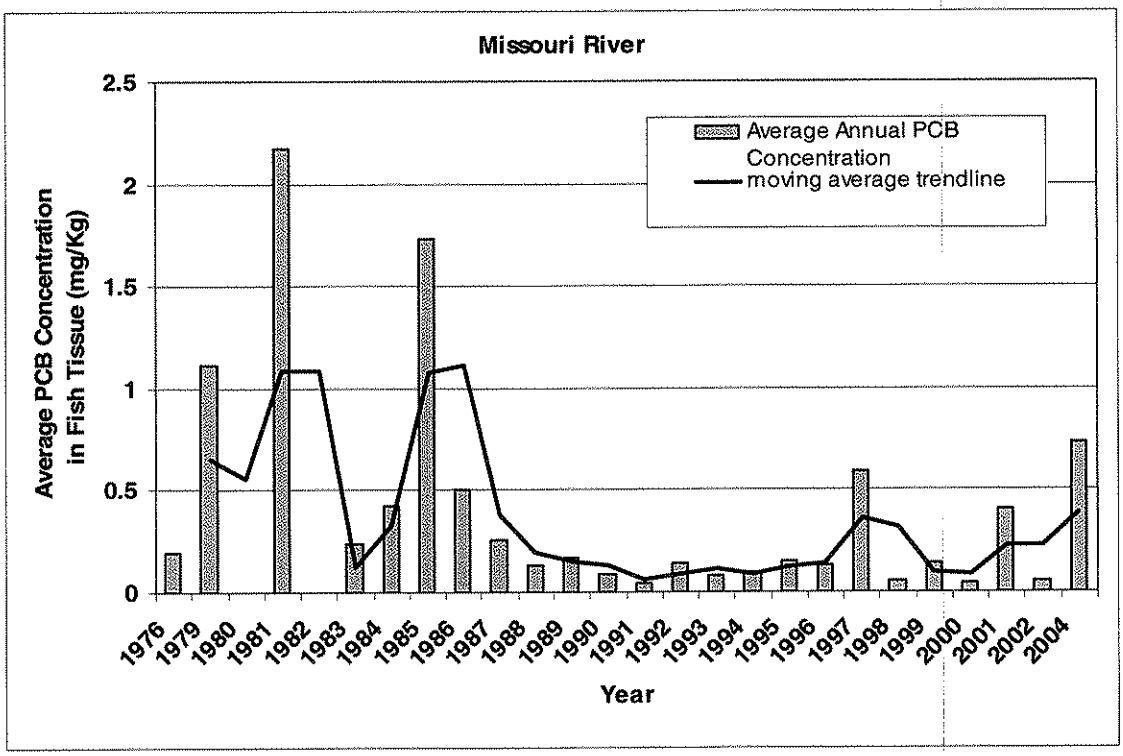


Figure 4: Average Annual PCB Concentration and Three-Year Moving Average in Missouri River over Time



The department recognizes that data collected to date do not always reflect a downward trend of PCBs or chlordane on a year-to-year basis; however, that this is most likely due to collection inconsistencies. Some years of data contain tissue samples of many different fish species, but some years contain only one or two species of fish. Fatty fish, such as carp, tend to absorb more PCBs than a less fatty fish such as catfish. Likewise, feeding habits, rainfall and age and size of the fish can effect the amount of sediment (thus PCBs and chlordane) assimilated by fish or the bio-accumulative effect. The most recent data predominately sampled catfish and sturgeon, however in 2004, only sturgeon was sampled. This would tend to show increasing levels of PCBs and chlordane in later years and obscure the overall downward trend. When only fillets are considered, from the year 2000 to the present, concentrations of both compounds are consistently below the stated action levels.

As mentioned, these pollutants degrade slowly and are extremely persistent in the environment. However, since they are no longer produced, a downward trend is inevitable and this TMDL recommends development of a consistent protocol for measurement of the pollutants in fish tissue and continued sampling.

This is a phased TMDL, which means that if future data indicates fish tissue chlordane and PCB levels are not continuing to decline, this TMDL will be re-evaluated. This TMDL will be incorporated into Missouri's Water Quality Management Plan.

7. Public Participation

This TMDL was on public notice from June 9 to July 9, 2006. Due to comments received during the first notice period, which resulted in substantial changes to the TMDL document, a second public notice period was needed. This period was from Aug. 30 to Sept. 29, 2006. Groups who received the public notice announcement included the Missouri Clean Water Commission, the Water Quality Coordinating Committee, the water quality departments in neighboring states where the Missouri River is a shared border (Kansas and Nebraska), the 155 Stream Team volunteers in the watershed, and the 51 legislators representing all the counties bordering this river. Also, the department posted the notice, the Missouri River Information Sheet and this document on its Web site, making them available to anyone with access to the Web. The department has placed a copy of the notice, the comments received and its responses in the Missouri River file.

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Appendix

Table A: Sampling Locations along Missouri River

Table B: Missouri River Fish Tissue Data

Table A: Sampling Locations along Missouri River

Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
1	Missouri River	Rulo, Nebraska	RM 498	40.0394	-95.4144	NDEQ
2	Missouri River	below Nodaway River, Missouri	RM 462.6	39.9003	-94.96022	MDC
3	Missouri River	Nodaway Island Access, Missouri	RM 462.1	39.9013	-94.9531	MDC
4	Missouri River	St. Joseph, Missouri	RM 448.2	39.754	-94.858	EPA/MDNR USEPA MDC
5	Missouri River	Leavenworth, Kansas	RM 397	39.3291	-94.9085	USEPA MDC USGS
6	Missouri River	Kansas City, Missouri	RM 365.8	39.1194	-94.534	EPA/MDNR USEPA MDC USGS
7	Missouri River	below I-635, Missouri	RM 374	39.1531	-94.6495	USEPA MDC
8	Missouri River	below US 169, Missouri	RM 365.9	39.113	-94.586	USEPA
9	Missouri River	above Hwy 269, Missouri	RM 363	39.1387	-94.5424	USEPA
10	Missouri River	above I-435, Missouri	RM 361	39.1515	-94.5117	USEPA
11	Missouri River	below Blue Ridge Blvd., Missouri	RM 358	39.1291	-94.4686	USEPA EPA/MDNR MDC
12	Missouri River	near Shoal Creek, Missouri	RM 351.8	39.168	-94.3723	USEPA MDC
13	Missouri River	Napolean, Missouri	RM 329.2	39.1342	-94.0645	MDC
14	Missouri River	Lexington, Missouri	RM 317.3	39.1869	-93.8965	EPA/MDNR USEPA MDC
15	Missouri River	near Malta Bend, Missouri	RM 275.3	39.2382	-93.3614	MDC
16	Missouri River	Miami, Missouri	RM 262.7	39.3289	-93.2252	MDC
17	Missouri River	Glasgow, Missouri	RM 226.5	39.2223	-92.8505	MDC
19	Missouri River	Boonville, Missouri	RM 196.7	38.9812	-92.7456	MDC

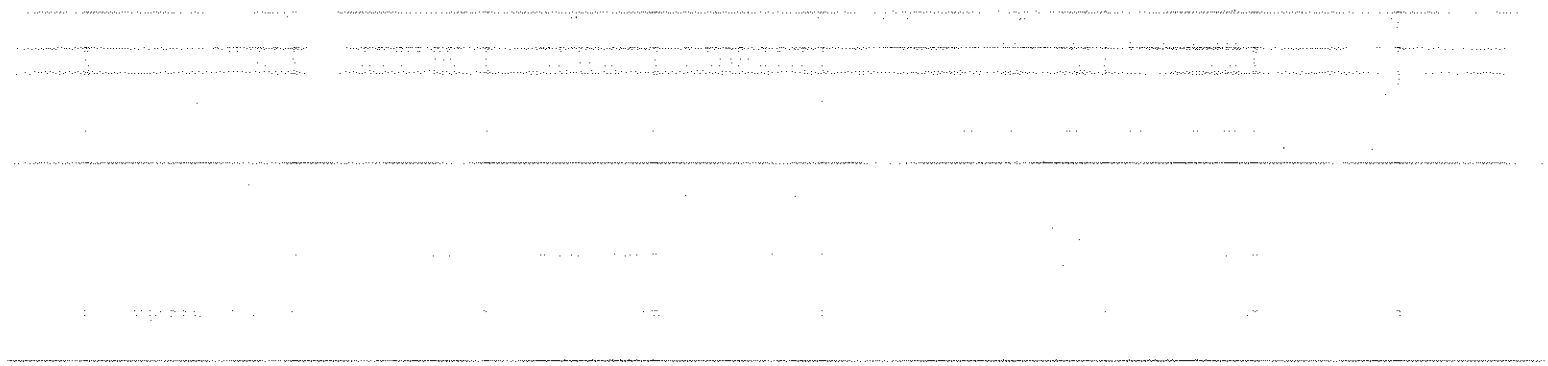


Table A: Sampling Locations along Missouri River

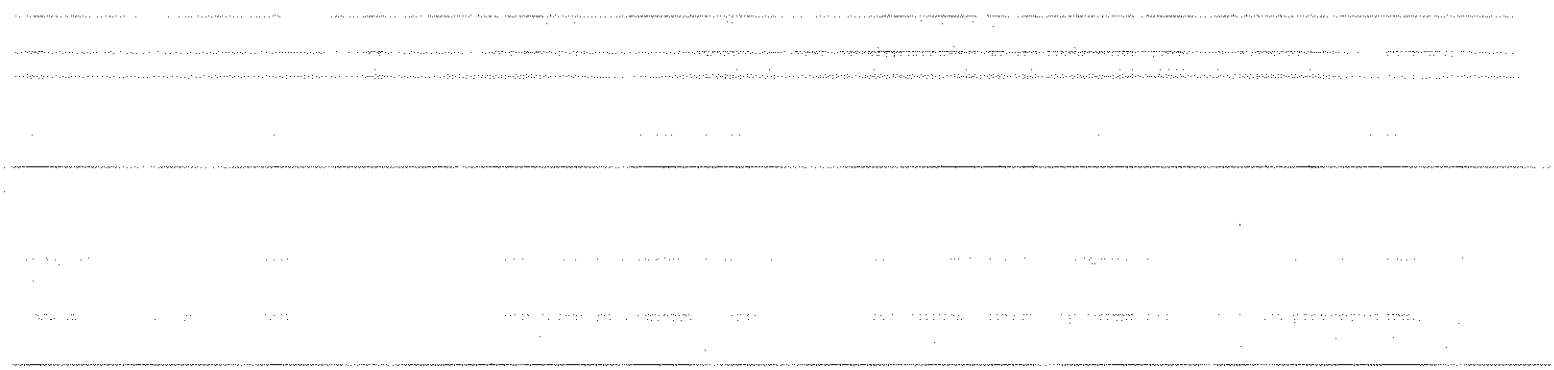
Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
19	Missouri	near Columbia,	RM 185	38.9597	-92.545	EPA/MDNR
20	Missouri River	Jefferson City, Missouri	RM 143.2	38.5875	-92.1788	USEPA MDC
21	Missouri River	Mokane, Missouri	RM 123.4	38.6519	-91.8831	MDC
22	Missouri River	Hermann, Missouri	RM 97.9	38.71	-91.4391022	EPA/MDNR MDC USGS
23	Missouri River	Weldon Springs CA, Missouri	RM 44.1	38.6565	-90.7332	MDC
24	Missouri River	Chesterfield, Missouri	RM 39	38.6874	-90.6627	USPHS MDC
25	Missouri River	St. Charles, Missouri	RM 28.2	38.7984	-90.4662	MDC

Table B: Missouri River Fish Tissue Data for Sum of the Isomers (SOI) of Chlordane and PCBs from 1976 to 2004

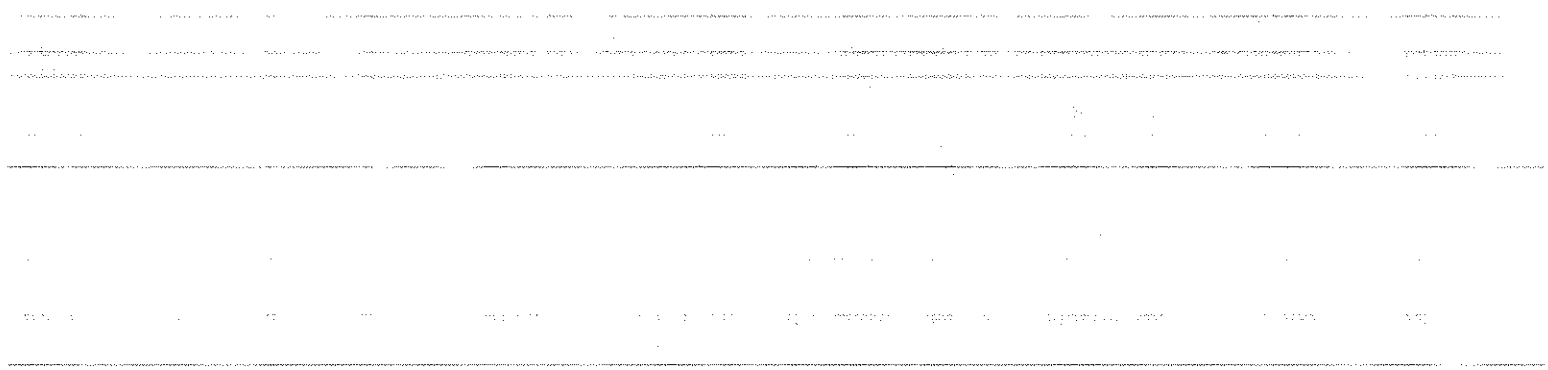
Note: For use in calculations, the original data were adjusted as follows: Where the data were recorded as "less than" values, half that value is used. Where data were recorded as "Trace amount", zero (0) is used. The SOI Chlor and PCB columns below reflect these adjustments. The units for both are milligrams per kilogram (mg/kg).

Org	Site	WBID	Site Name	Date	Species	County	Type	# in sample	SOI Chlor	PCB
MDC	701/92.2	701	Missouri R. @ Boonville	1976	CAT	COOPER		6		0.81
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	MIXED	COLE				0.462
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	RED	COLE		1		0.161
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	FH CAT	COLE		1		0
USEPA	701/39.5	701	Missouri R. @ Jefferson City	1976	G EYE	COLE		1		0.448
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	CARP	BUCHANAN		1		0.12
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	G EYE	BUCHANAN		4		0.281
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	S GAR	BUCHANAN		1		0.086
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1976	CARPSU	BUCHANAN		3		0.166
USEPA	u	356	MO R. KC	1976	CARP			1		0.344
USEPA	u	356	MO R. KC	1976	G SHAD			3		0.751
USEPA	u	356	MO R. KC	1976	BUF			2		0.121
USEPA	u	356	MO R. KC	1976	B CRA			1		0
USGS	1604/97.9	1604	Missouri R. @ Hermann	1979	SM BUF	GASCONADE	W	1		0.9
USGS	1604/97.9	1604	Missouri R. @ Hermann	1979	CARPSU	GASCONADE	W	1		2.2
USGS	1604/97.9	1604	Missouri R. @ Hermann	1979	CARPSU	GASCONADE	W	1		1.7
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1980	B BUF	GASCONADE	W	5		0
EPA/MDNR	226/80.5	226	Missouri R.@ St. Joseph, Mo.	1980	CARP	BUCHANAN	W	5		0
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1981	CARP	GASCONADE	W	5		0

USEPA	226/30.1	226	Missouri R. @ Leavenworth, KS	1981	CARP	PLATTE	W	5		0
USEPA	356/77.4	356	Missouri R. @ Lexington	1981	CARP	LAFAYETTE	W	5		0
USEPA	356/77.4	356	Missouri R. @ Lexington	1981	CARP	LAFAYETTE	W	3		0
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1981	CARP	BUCHANAN	W	5		0
EPA/MDNR	u	356	MO R. KC	1981	CARP		W	5		0
USEPA	u	356	MO R. KC	1981	CARP		W	5		0
USEPA	u	356	MO R. KC	1981	CARP		W	6		22.3
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1982	B BUF	GASCONADE	W	5		0
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1982	CARP	BUCHANAN	W	5		0
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1983	CARP	GASCONADE	W	3		0.24
USEPA	226/30.1	226	Missouri R. @ Leavenworth, KS	1983		PLATTE	W			0
USEPA	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1983		BUCHANAN	W			0
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1983	CARP	BUCHANAN	W	5		0
EPA/MDNR	u	356	MO R. KC	1983	CARP		W	6		0
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1984	CARP	GASCONADE	W	1		0.054
EPA/MDNR	356/77.4	356	Missouri R. @ Lexington	1984	CARP	LAFAYETTE	W	5		0
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	CH CAT	BOONE	F	20		0.077
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	CARPSU	BOONE	F	20		0.254
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	FH CAT	BOONE	F	20		0.095
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	SHSTUR	BOONE	F	20		2.52
EPA/MDNR	701/80.7	701	Missouri R. nr. Columbia	1984	CARP	BOONE	F	14		0.058
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1984	CARP	BUCHANAN	W	7		0
EPA/MDNR	u	356	MO R. KC	1984	CARP		W	5		2.11
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1985	CARP	GASCONADE	W	3		0.159
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1985	CARP	GASCONADE	W	3		0.285
EPA/MDNR	356/77.4	356	Missouri R. @ Lexington	1985	CARP	LAFAYETTE	W	5		0.53
EPA/MDNR	356/77.4	356	Missouri R. @ Lexington	1985	CARP	LAFAYETTE	W	5		0
EPA/MDNR	u	356	MO R. KC	1985	CARP		W	4		5.11
EPA/MDNR	u	356	MO R. KC	1985	CARP		W	3		7.49
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1986	CARP	GASCONADE	W	6		0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	CH CAT	BOONE	F			0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	BUF	BOONE	F			0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E			1.807
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	CARP	BOONE	F			0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F			0.551
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E			1.039
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E			1.512
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E			1.131
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	E			2.363
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	W BASS	BOONE	F			0.075
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F			1.265
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F			0.493
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	CARPSU	BOONE	F			0.356
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	DRUM	BOONE	F			0.123
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F			0.578
MDC	701/80.7	701	Missouri R. nr. Columbia	1986	SHSTUR	BOONE	F			0.316
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1986	CARP	BUCHANAN	W	5		0.13
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1986	CARP	BUCHANAN	W	5		0.13
EPA/MDNR	u	356	MO R. KC	1986	CARP		W	5		1.225
EPA/MDNR	u	356	MO R. KC	1986	CARP		W	5		2.165
MDC	u	356	MO R. KC	1986	CARP		F	5		0
MDC	u	356	MO R. KC	1986	CH CAT		F	5		0
MDC	701/92.2	701	Missouri R. @ Boonville	1987	FH CAT	COOPER	F	1		0.274
MDC	701/92.2	701	Missouri R. @ Boonville	1987	FH CAT	COOPER	F	5		0.09
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	5		0.205
R	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	5		0.092
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	5		0.071
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CH CAT	COOPER	F	1		0.245



MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARP	COOPER	F	5		0.07
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARP	COOPER	F	5		0.093
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARP	COOPER	F	1		0.09
MDC	701/92.2	701	Missouri R. @ Boonville	1987	CARPSU	COOPER	F	5		0.068
MDC	701/92.2	701	Missouri R. @ Boonville	1987	SHSTUR	COOPER	F	6		0.303
MDC	701/92.2	701	Missouri R. @ Boonville	1987	DRUM	COOPER	F	5		0.019
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	BM BUF	ST LOUIS	F	5		0.025
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	FH CAT	ST LOUIS	F	3		0.025
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	CARP	ST LOUIS	F	5		0.025
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	BL CAT	ST LOUIS	F	3		0.121
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	CH CAT	ST LOUIS	F	3		0.081
MDC	1604/43.9	1604	Missouri R. @ Chesterfield	1987	CARP	ST LOUIS	F	5		0.025
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1987	CARP	GASCONADE	W	2		0.122
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	FH CAT	PLATTE	F	5		0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	1		0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	4		0.036
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CH CAT	PLATTE	F	3		0.121
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	FH CAT	PLATTE	F	4		0.121
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	5		0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	5		0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CARP	PLATTE	F	5		0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	CH CAT	PLATTE	F	5		0.025
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1987	FH CAT	PLATTE	F	5		0.053
MDC	356/77.4	356	Missouri R. @ Lexington	1987	CH CAT	LAFAYETTE	F	5		0.025
MDC	356/77.4	356	Missouri R. @ Lexington	1987	SM BUF	LAFAYETTE	F	1		0.025
MDC	356/77.4	356	Missouri R. @ Lexington	1987	FH CAT	LAFAYETTE	F	5		0.055
MDC	356/77.4	356	Missouri R. @ Lexington	1987	CARP	LAFAYETTE	F	5		0.139
USEPA	356/124.2	356	Missouri R. ab. Hwy. 269	1987	CARP	JACKSON	W	3		0.54
USEPA	356/124.2	356	Missouri R. ab. Hwy. 269	1987	CARP	JACKSON	W	3		0.64
USEPA	356/122.2	356	Missouri R. ab. I-435	1987	CARP	JACKSON	W	3		0.702
USEPA	356/122.2	356	Missouri R. ab. I-435	1987	CARP	JACKSON	W	3		0.425
USEPA	356/119.2	356	Missouri R. bl. Blue R.	1987	CARP	CLAY	W	3		3.22
USEPA	356/119.2	356	Missouri R. bl. Blue R.	1987	CARP	CLAY	W	3		1.26
USEPA	226/6.7	226	Missouri R. bl. I-635	1987	CARP	PLATTE	W	3		0.63
USEPA	226/6.7	226	Missouri R. bl. I-635	1987	CARP	PLATTE	W	3		0.63
USEPA	356/127.2	356	Missouri R. bl. US 169	1987	CARP	JACKSON	W	4		0.673
USEPA	356/127.2	356	Missouri R. bl. US 169	1987	CARP	JACKSON	W	5		0.395
USEPA	356/112.7	356	Missouri R. nr. Shoal Cr.	1987	CARP	CLAY	W	3		0.225
USEPA	356/112.7	356	Missouri R. nr. Shoal Cr.	1987	CARP	CLAY	W	3		0.215
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1987	CARP	BUCHANAN	W	4		0.18
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1987	CARP	BUCHANAN	W	4		0.279
EPA/MDNR	u	356	MO R. KC	1987	CARP		W	3		3
MDC	u	356	MO R. KC	1987	DRUM		F	5		0.025
MDC	u	356	MO R. KC	1987	FH CAT		F	3		0.025
EPA/MDNR	u	356	MO R. KC	1987	CARP		W	3		1.335
MDC	u	356	MO R. KC	1987	CH CAT		F	4		0.025
MDC	u	356	MO R. KC	1987	CH CAT		F	4		0.092
MDC	u	356	MO R. KC	1987	SHSTUR		F	1		0.17
MDC	u	356	MO R. KC	1987	BM BUF		F	5		0.025
MDC	u	356	MO R. KC	1987	SM BUF		F	5		0.025
MDC	u	356	MO R. KC	1987	CARPSU		F	5		0.092
MDC	u	356	MO R. KC	1987	CARP		F	5		0.053
MDC	u	356	MO R. KC	1987	CARP		F	5		0.095
MDC	u	356	MO R. KC	1987	CARP		F	5		0.079
MDC	u	356	MO R. KC	1987	CH CAT		F	3		0.025
MDC	u	356	MO R. KC	1987	FH CAT		F	4		0.025
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1988	CH CAT	GASCONADE	W	4		0.31
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	CARP	PLATTE	W	5		0.03



USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	G EYE	PLATTE	W	5		0.72
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	G SHAD	PLATTE	W	5		0.03
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	SHSTUR	PLATTE	W	5		0.7
USGS	226/30.1	226	Missouri R. @ Leavenworth, KS	1988	CH CAT	PLATTE	W	3		0.3
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CARP		F	5	0.049	0
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CH CAT		F	3	0.052	0.081
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CH CAT		F	3	0.013	0.43
NDEQ	226/NE		Missouri R. @ Rulo, NE	1988	CH CAT			3	0.03	0
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1988	CARP	CLAY	W	4		0.088
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1988	CARP	BUCHANAN	W	5		0.155
USGS	u	356	MO R. KC	1988	CARP		W	5		0.55
USGS	u	356	MO R. KC	1988	DRUM		W	5		0.62
USGS	u	356	MO R. KC	1988	CH CAT		W	5		0.33
MDC	701/92.2	701	Missouri R. @ Boonville	1989	CARP	COOPER	F	5		0.165
MDC	701/92.2	701	Missouri R. @ Boonville	1989	CH CAT	COOPER	F	5		0.111
MDC	701/92.2	701	Missouri R. @ Boonville	1989	FH CAT	COOPER	F	3		0.025
MDC	1604/97.9	1604	Missouri R. @ Hermann	1989	CH CAT	GASCONADE	F	5		0.133
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1989	CARP	GASCONADE	W	1		0.231
MDC	1604/97.9	1604	Missouri R. @ Hermann	1989	CARP	GASCONADE	F	3		0.127
MDC	1604/97.9	1604	Missouri R. @ Hermann	1989	CARP	GASCONADE	F	2		0.131
MDC	701/39.5	701	Missouri R. @ Jefferson City	1989	CH CAT	COLE	F	5		0.072
MDC	701/39.5	701	Missouri R. @ Jefferson City	1989	CARP	COLE	F	5		0.093
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1989	CH CAT	PLATTE	F	5		0.173
MDC	226/30.1	226	Missouri R. @ Leavenworth, KS	1989	CARP	PLATTE	F	5		0.025
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1989	CARP	ST CHARLES	F	5		0.151
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1989	CH CAT	ST CHARLES	F	3		0.161
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1989	CARP	CLAY		5		1.82
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CH CAT	BOONE	F	5		0.025
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	SHSTUR	BOONE	F	5		0.078
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CARP	BOONE	F	2		0.087
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CARP	BOONE	F	3		0.025
MDC	701/80.7	701	Missouri R. nr. Columbia	1989	CH CAT	BOONE	F	2		0.025
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1989	CH CAT	CLAY		5		0.082
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1989	CARP	CLAY		5		0.056
EPA/MDNR	226/80.5	226	Missouri R.@ St. Joseph, Mo.	1989	CARP	BUCHANAN	W	4		0.167
MDC	701/92.2	701	Missouri R. @ Boonville	1990	CARP	COOPER	F	5		0.1
MDC	701/92.2	701	Missouri R. @ Boonville	1990	CH CAT	COOPER	F	5		0.025
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1990	CARP	GASCONADE	W	3		0.367
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	SHSTUR	GASCONADE	F	5		0.285
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	CARP	GASCONADE	F	5		0.106
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	PADDLE	GASCONADE	F	1		0.025
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	CH CAT	GASCONADE	F	5		0.192
MDC	1604/97.9	1604	Missouri R. @ Hermann	1990	PADDLE	GASCONADE	F	1		0.025
MDC	701/39.5	701	Missouri R. @ Jefferson City	1990	CARP	COLE	F	5		0.025
MDC	701/39.5	701	Missouri R. @ Jefferson City	1990	CH CAT	COLE	F	5		0.084
MDC	226/6.7	226	Missouri R. bl. I-635	1990	FH CAT	PLATTE	F	5		0.025
MDC	226/6.7	226	Missouri R. bl. I-635	1990	CARP	PLATTE	F	5		0.025
MDC	356/36.4	356	Missouri R. nr. Malta Bend	1990	CARP	SALINE		5		0.091
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1990	CARP	CLAY	F	5		0.124
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1990	CH CAT	CLAY	F	5		0.079
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1990	CARP	BUCHANAN	W	5		0.355
MDC	701/121.9	701	Missouri R. @ Glasgow	1991	CH CAT	HOWARD				0
NDEQ	226/NE		Missouri R. @ Rulo, NE	1991	CH CAT		F	5	0.035	0
NDEQ	226/NE		Missouri R. @ Rulo, NE	1992	CH CAT		F	4		
NDEQ	226/NE		Missouri R. @ Rulo, NE	1992	CH CAT		F	4		
NDEQ	226/NE		Missouri R. @ Rulo, NE	1992	CH CAT		F	4		
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1992	CARP	CLAY		1		
EPA/MDNR	1604/97.9	1604	Missouri R. @ Hermann	1993	CARP	GASCONADE	W	2		0.05

EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1993	CARP	BUCHANAN	W	3		0.23
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1994	CARP	CLAY	F	18		0.025
MDC	356/112.7	356	Missouri R. nr. Shoal Cr.	1994	CARP	CLAY	F	18		0.161
USGS-BEST	1604/97.9	1604	Missouri R. @ Hermann	1995	BASS	GASCONADE	W	17	0.05	0.05
USGS-BEST	1604/97.9	1604	Missouri R. @ Hermann	1995	CARP	GASCONADE	W	15	0.09	0.3
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1995	CARP	CLAY	W	5		0.443
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1995	CARP	BUCHANAN	W	5		0.079
NDEQ	226/NE		Missouri R. @ Rulo, NE	1996	CH CAT		F	5	0.03	0.093
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	SHSTUR	ST CHARLES	F	13	0.113	0.025
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	SHSTUR	ST CHARLES	E		0.105	0.025
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	CARP	ST CHARLES	F	23	0.066	0.112
MDC	1604/28.0	1604	Missouri R. @ St. Charles	1996	CH CAT	ST CHARLES	F	24	0.054	0.065
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CARP	BOONE	F	14	0.054	0.079
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	BUF	BOONE	F	15	0.073	0.131
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	SHSTUR	BOONE	F	25	0.018	0.23
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CARP	BOONE	F	14	0.059	0.074
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CARP	BOONE	F	17	0.053	0.084
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	BUF	BOONE	F	10	0.066	0.025
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	SHSTUR	BOONE	E	5	0.096	0.354
MDC	701/80.7	701	Missouri R. nr. Columbia	1996	CH CAT	BOONE	F	25	0.073	0.059
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	F	7	0.039	0.183
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	CH CAT	BUCHANAN	F	25	0.019	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	CARP	BUCHANAN	F	17	0.017	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	E		0.188	0.586
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	CARP	BUCHANAN	F	28	0.032	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	BUF	BUCHANAN	F	6	0.077	0.102
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	BUF	BUCHANAN	F	11	0.054	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	F	13	0.038	0.099
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1996	SHSTUR	BUCHANAN	E		0.299	0.698
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1997	CARP	CLAY	W	4		1.56
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1997	CARP	CLAY	W	3		1.26
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1997	CARP	BUCHANAN	F	25	0.04	0.025
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1997	CH CAT	BUCHANAN	F	15	0.024	0.025
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1997	CARP	BUCHANAN	W	4		0.092
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	1998	CARP	ST LOUIS	F	25	0.032	0.083
MDC	701/80.7	701	Missouri R. nr. Columbia	1998	FH CAT	BOONE		15	0.005	0.02
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1999	CARP	CLAY	W	5		0.126
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	1999	CARP	CLAY	W	5		0.22
MDC	701/80.7	701	Missouri R. nr. Columbia	1999	CARP	BOONE	F	25	0.042	0.025
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	1999	CARP	BUCHANAN	W	5		0.187
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2000	FH CAT	ST CHARLES	F	16	0.016	0.053
MDC	226/93.4	226	Missouri R. bl. Nodaway R.	2000	CH CAT	ANDREW		15	0.009	0.009
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2000	CARP	BUCHANAN	F	10	0.092	0.029
MDC	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2000	CARP	BUCHANAN	F	15	0.04	0.022
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	2001	CARP	CLAY	W	5		0.802
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2001	CARP	BUCHANAN	W	5		0.154
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2001	CARP	BUCHANAN	W	5		0.262
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2002	CARP	ST CHARLES	F	15	0.04	0.052
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2002	FH CAT	ST CHARLES	F	17	0.028	0.077
MDC	701/80.7	701	Missouri R. nr. Columbia	2002	CARP	BOONE	F	26	0.018	0.028
MDC	356/23.4	356	Missouri R. @ Miami	2004	SHSTUR	SALINE	F	5	0.037	0.229
MDC	356/23.4	356	Missouri R. @ Miami	2004	SHSTUR	SALINE	F	5	0.024	0.278
MDC	356/23.4	356	Missouri R. @ Miami	2004	SHSTUR	SALINE	F	5	0.018	0.165
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.105	1.14
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.144	1.52
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	F	5	0.025	0.393

MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	F	5	0.049	0.346
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	F	5	0.093	0.807
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.086	
MDC	701/19.7	701	Missouri R. @ Mokane	2004	SHSTUR	CALLAWAY	E	1	0.056	0.454
MDC	356/87.7	356	Missouri R. @ Napoleon	2004	SHSTUR	LAFAYETTE		15	0.05	0.483
MDC	356/87.7	356	Missouri R. @ Napoleon	2004	SHSTUR	LAFAYETTE		6	0.39	4.01
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.133	0.889
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW		5	0.031	0.22
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW		5	0.022	0.23
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.193	0.532
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.077	0.758
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	F	5	0.038	0.422
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.14	0.867
MDC	226/99.6	226	Missouri R. @ Nodaway Island Access	2004	SHSTUR	ANDREW	E	1	0.103	0.726
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES		5	0.036	0.184
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	E	1	0.114	0.57
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	E	1	0.07	1.1
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	F	5	0.058	0.431
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	F	5	0.058	0.739
MDC	1604/47.5	1604	Missouri R. @ Weldon Spring CA	2004	SHSTUR	ST CHARLES	E	1	0.113	0.766
EPA/MDNR	356/119.2	356	Missouri R. bl. Blue R.	2005	C CARP	JACKSON		5		0.58
EPA/MDNR	226/80.5	226	Missouri R. @ St. Joseph, Mo.	2005	C CARP	BUCHANAN	W	5		0.049

Note: Site = WBID/number of miles from mouth; u = urban; r = rural; # in sample = the number of fish in each "sample".
Type = what form of the fish is evaluated:

W = the whole fish
F = the fillet of the fish only
E = the fish eggs only

Section

3

FedEx Express **US Airbill**

FedEx Tracking Number **8534 4247 7873**

Form ID No. 0215 — Sender's Copy

1 From *Please print and press hard.*

Date July 5, 2006 Sender's FedEx Account Number 1423-6567-7

Sender's Name John DeLashmit Phone (913) 551-7211

Company US EPA

Address 901 N 5TH ST

Dept./Floor/Suite/Room

City KANSAS CITY State KS ZIP 66101-2907

2 Your Internal Billing Reference First 24 characters will appear on invoice. OPTIONAL

3 To

Recipient's Name Edward Galbraith Phone ( )

Company Missouri Department of Natural Resources

Recipient's Address 1101 Riverside Dr

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Dept./Floor/Suite/Room

Address

To request a package be held at a specific FedEx location, print FedEx address here.

City Jefferson City, State MO ZIP 65101

0318286190

Try online shipping at fedex.com

By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

Questions? Go to our Web site at fedex.com
or call 1.800.GoFedEx 1.800.463.3339.

4a Express Package Service To add SATURDAY Delivery, see Section 6. *Packages up to 150 lbs.* * To most locations.

- [X] FedEx Priority Overnight — Next business morning.*
- [ ] FedEx Standard Overnight — Next business afternoon.*
- [ ] FedEx First Overnight — Earliest next business morning delivery to select locations.*
- [ ] FedEx 2Day — Second business day.*
- [ ] FedEx Express Saver — Third business day.*

FedEx Envelope rate not available. Minimum charge: One-pound rate.

4b Express Freight Service To add SATURDAY Delivery, see Section 6. *Packages over 150 lbs.* ** To most locations.

- [ ] FedEx 1Day Freight* — Next business day.**
- [ ] FedEx 2Day Freight — Second business day.**
- [ ] FedEx 3Day Freight — Third business day.**

* Call for Confirmation:

5 Packaging * Declared value limit $500.

- [X] FedEx Envelope*
- [ ] FedEx Pak* — Includes FedEx Small Pak, FedEx Large Pak, and FedEx Sturdy Pak.
- [ ] FedEx Box
- [ ] FedEx Tube
- [ ] Other

6 Special Handling Include FedEx address in Section 3.

- [ ] **SATURDAY Delivery** Available ONLY for FedEx Priority Overnight, FedEx 2Day, FedEx 1Day Freight, and FedEx 2Day Freight to select ZIP codes.
- [ ] **HOLD Weekday** at FedEx Location NOT Available for FedEx First Overnight.
- [ ] **HOLD Saturday** at FedEx Location Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

Does this shipment contain dangerous goods? One box must be checked.

- [ ] No
- [ ] Yes — As per attached Shipper's Declaration.
- [ ] Yes — Shipper's Declaration not required.
- [ ] Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging.

- [ ] Cargo Aircraft Only

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below.

- [X] Sender — Acct. No. in Section 1 will be billed.
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

FedEx Acct. No.
Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
		$ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. FedEx Use Only

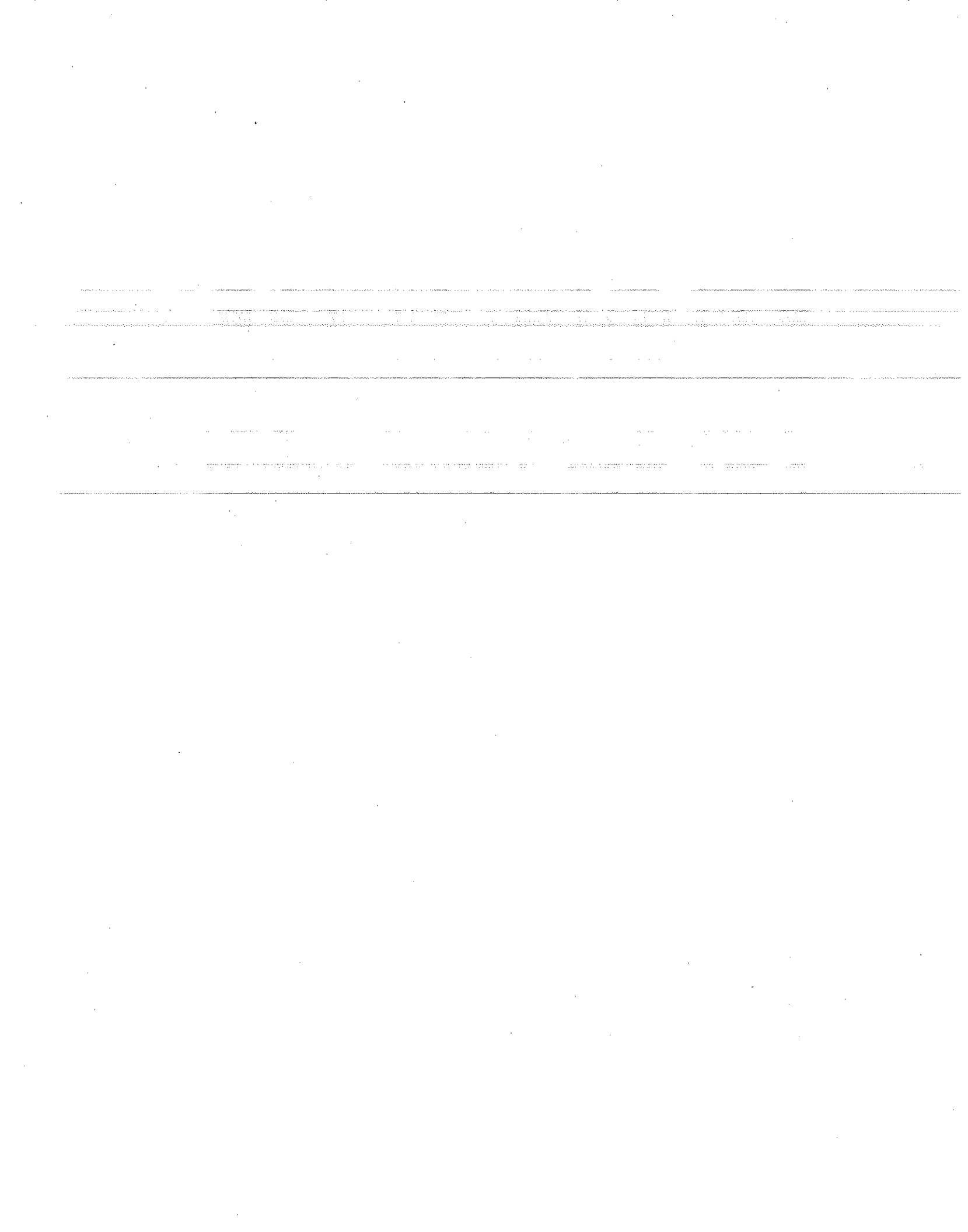
8 *NEW* Residential Delivery Signature Options If you require a signature, check Direct or Indirect.

- [X] No Signature Required — Package may be left without obtaining a signature for delivery.
- [ ] Direct Signature — Anyone at recipient's address may sign for delivery. *Fee applies.*
- [ ] Indirect Signature — If no one is available at recipient's address, anyone at a neighboring address may sign for delivery. *Fee applies.*

519

Rev. Date 5/05•Part #158279•©1994–2005 FedEx•PRINTED IN U.S.A.•SRS

PULL AND RETAIN THIS COPY BEFORE AFFIXING TO THE PACKAGE.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

JUL 0 5 2006

Mr. Edward Galbraith, Director
Water Pollution Control Program
Water Protection and Soil Conservation Division
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102

Dear Mr. Galbraith:

RE: Comments on Draft TMDLs public noticed on the MDNR website: Missouri River and Mississippi River.

The U.S. Environmental Protection Agency (EPA) is providing these comments on the proposed final Total Maximum Daily Loads (TMDLs) public noticed on the Missouri Department of Natural Resources (MDNRs) website; http://www.dnr.mo.gov/env/wpp/wpcp-pn.htm.

Missouri River TMDL public notice period June 9, 2006, to July 9, 2006, comments are in enclosure A.

Mississippi River TMDL public notice period June 9, 2006, to July 9, 2006, comments are in enclosure A.

EPA has completed its review of the draft TMDLs on public notice. By this letter, EPA is submitting comments concerning the draft TMDLs as listed in enclosure A. EPA appreciates the opportunity to comment and the thoughtful effort that MDNR has put into these draft TMDLs. EPA will continue to cooperate with and assist, as appropriate, in future efforts by MDNR to develop TMDLs.

If you have any questions or concerns in regards to this matter, please do not hesitate to contact Jack Generaux, TMDL Team Leader, at (913)551-7690, or Tabatha Adkins, TMDL Team, at (913)551-7128.

Sincerely,

John DeLashmit
Chief
Water Quality Management Branch

cc: Ann Crawford, TMDL Chief
Missouri Department of Natural Resources

Phil Schroeder
Missouri Department of Natural Resources

Enclosure A

Regarding: Draft TMDLs for the Missouri and Mississippi Rivers, Chlordane and PCB Impairments

EPA has reviewed the draft documents and has the following comments which need to be addressed in the final TMDL:

We have no specific comments regarding the draft TMDLs as posted by MDNR. As a general observation, most TMDLs generally have targeted water column endpoints but in these instances, the targets were set based on fish tissue levels to protect human health. In some TMDLs developed across the country for fish tissue impairments, a generic translator (bioaccumulation factor) was used to relate the fish tissue to expected water column concentrations. The same approach could have been used here; but, that process would not have changed the conclusions of the TMDL. WLA and LA would still be set to zero because the chemical manufacturing has been stopped and the residual in the environment is degrading (albeit perhaps over a long time). Also identifying seasonal variation is not practical because the fish tissue impairment represents the result of long-term exposures to varied conditions. By continued monitoring of the fish tissue, the public will be kept informed of potential risks and ultimately, the levels should be such that fish advisories will no longer be necessary.

Mr. Edward Galbraith, Director
Water Pollution Control Program
Water Protection and Soil Conservation Division
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102

Dear Mr. Galbraith:

RE: Comments on Draft TMDLs public noticed on the MDNR website: Missouri River and Mississippi River.

The U.S. Environmental Protection Agency (EPA) is providing these comments on the proposed final Total Maximum Daily Loads (TMDLs) public noticed on the Missouri Department of Natural Resources (MDNRs) website; http://www.dnr.mo.gov/env/wpp/wpcp-pn.htm.

Missouri River TMDL public notice period June 9, 2006, to July 9, 2006, comments are in enclosure A.

Mississippi River TMDL public notice period June 9, 2006, to July 9, 2006, comments are in enclosure A.

EPA has completed its review of the draft TMDLs on public notice. By this letter, EPA is submitting comments concerning the draft TMDLs as listed in enclosure A. EPA appreciates the opportunity to comment and the thoughtful effort that MDNR has put into these draft TMDLs. EPA will continue to cooperate with and assist, as appropriate, in future efforts by MDNR to develop TMDLs.

If you have any questions or concerns in regards to this matter, please do not hesitate to contact Jack Generaux, TMDL Team Leader, at (913)551-7690, or Tabatha Adkins, TMDL Team, at (913)551-7128.

Sincerely,

John DeLashmit
Chief
Water Quality Management Branch

WWPD/WQMB:Adkins:MCx7490:06-29-06:H:WQMB/2006 Correspondence/Adkins/Iron Horse Trail Lake WScover.doc

WQMB	WQMB	WQMB
Adkins	Generaux	DeLashmit
7/30/06	7/5/06	7/5/06

cc: Ann Crawford, TMDL Chief
Missouri Department of Natural Resources

Phil Schroeder
Missouri Department of Natural Resources

Enclosure A

Regarding: Draft TMDLs for the Missouri and Mississippi Rivers, Chlordane and PCB Impairments

EPA has reviewed the draft documents and has the following comments which need to be addressed in the final TMDL:

We have no specific comments regarding the draft TMDLs as posted by MDNR. As a general observation, most TMDLs generally have targeted water column endpoints but in these instances, the targets were set based on fish tissue levels to protect human health. In some TMDLs developed across the country for fish tissue impairments, a generic translator (bioaccumulation factor) was used to relate the fish tissue to expected water column concentrations. The same approach could have been used here; but, that process would not have changed the conclusions of the TMDL. WLA and LA would still be set to zero because the chemical manufacturing has been stopped and the residual in the environment is degrading (albeit perhaps over a long time). Also identifying seasonal variation is not practical because the fish tissue impairment represents the result of long-term exposures to varied conditions. By continued monitoring of the fish tissue, the public will be kept informed of potential risks and ultimately, the levels should be such that fish advisories will no longer be necessary.

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

Matt Blunt, Governor • Doyle Childers, Director

www.dnr.mo.gov

August 22, 2006

Mr. John DeLashmit
U.S. Environmental Protection Agency
Region VII
901 North Fifth Street
Kansas City, KS 66101

RE: Response to Comments on the Mississippi and Missouri Rivers Total Maximum Daily Loads

Dear Mr. DeLashmit:

This letter responds to comments from the U.S. Environmental Protection Agency (EPA) on the draft Total Maximum Daily Loads (TMDLs) for the Mississippi and Missouri Rivers.

We appreciate your observations. In response to public comments received during the comment period, however, the Department of Natural Resources (department) has made changes to the TMDL targets. In light of this, we will place these documents on public notice again. Enclosed please find the comments and the department's responses.

Thank you for your comments and for EPA's support in the TMDL process. If you have other questions or wish to discuss this further, please contact Ms. Anne Peery at (573) 526-1426 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM

Philip A. Schroeder, Chief
Water Quality Monitoring and Assessment Section

PS:apl

Enclosure

TMDL/ Decision Document QC Check

Water Body Name Missouri River **Pollutant** Chlordane and PCB

Checks needed for the TMDL Submittal

- ☑ ☐ Submittal Letter
- ☑ ☐ Waterbody name
- ☑ ☐ HUC correct
- ☑ ☐ impaired use
- ☐ ☐ priority
- ☑ ☐ LA+WLA+MOS=TMDL
- ☑ ☐ 303(d) List WBID
- ☑ ☐ designated use
- ☑ ☐ pollutant
- ☑ ☐ Standard is cited and correct

Segment description from 303d list same as in Table 4 WQS

- ☑ ☐ TMDL segment agrees with description

Decision Document Requirements Section by Section

Submittal Letter
- ☑ ☐ includes date of receipt by EPA
- NA ☐ includes date of any revisions

Water Quality Standards Attainment
- ☑ ☐ targeted pollutant is validated
- ☑ ☐ a numeric target for pollutant is stated
- ☐ ☐ narrative/numeric cause effect relationship given
- ☑ ☐ loading capacity is given
- ☑ ☐ includes statement that WQS should be attained

Numeric Targets
- ☑ ☐ water quality standards are listed
- ☑ ☐ designated uses are listed
- ☑ ☐ ~~numeric~~ or narrative criteria are listed
- NA ☐ for narrative criteria a numeric link is stated

Link between numeric targets and pollutant
- ☑ ☐ links are expressed as ~~direct~~ or established
- ☑ ☐ established links are explained through analytical analysis end point

Source Analysis
- ☑ ☐ all potential sources of pollutant loads to the waterbody are given
- ☑ ☐ point, non-point and background sources are discussed
- ☑ ☐ point sources and their NPDES identifications are given
- ☑ ☐ a final statement that the listing seems complete

Allocation
- ☑ ☐ general statement leading up to specific loading allocations

WLA Comment
- NA ☐ total WLA given as well as a list of each source with permit identification numbers and its WLA with units
- ☑ ☐ if no WLA it is stated to be zero

LA Comment
- NA ☐ nonpoint load given with units
- ☑ ☐ if no LA it is stated as zero

Margin of Safety
- ☑ ☐ MOS stated as ~~implicit~~, explicit or both
- ☑ ☐ discussion of conservative assumptions for implicit MOS
- NA ☐ numeric MOS given and rational for the MOS

Seasonal Variation and Critical Conditions
- ☑ ☐ any seasonal components of TMDL are discussed
- ☑ ☐ any specific critical conditions (ie., low flow) discussed

Public Participation
- ☐ ☐ all public meeting listed, time and location
- ☑ ☐ any additional opportunity for public review (web site) given
- ☑ ☐ statement on how comments were considered

Monitoring Plan
- ☑ ☐ a specific monitoring plan is listed
- ☑ ☐ at least a minimum number of samples and a time frame are given

Reasonable Assurances
- NA ☐ if nonpoint source reductions are required to meet insufficient WLA there must be assurances the reductions will be met by LA
- ☑ ☐ if no reasonable assurances, explanation of why there are none

Primary B Perkins **(init.** BP**)** **Peer** _____ **(init.**_____**)**

Section

4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

NOV 03 2006

Mr. Edward Galbraith, Director
Water Protection Program
Water Protection and Soil Conservation Division
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102

Dear Mr. Galbraith:

Re: Approval of Mississippi and Missouri rivers TMDLs

This letter responds to the Missouri Department of Natural Resources (MDNR) document submissions received by the U.S. Environmental Protection Agency (EPA) Region 7 on October 11, 2006, addressing seven Total Maximum Daily Loads (TMDL). These TMDLs address the human health (fish consumption) use impairment of the Mississippi River (water body IDs 0001, 3152, and 1707) and the Missouri River (water body IDs 1604, 0701, 0356 and 0226), with pollutants of Chlordane and Polychlorinated Biphenyls.

EPA has completed its review of these TMDL documents with supporting documentation and information. By this letter, EPA approves the submitted TMDL documents. Enclosed with this letter are EPA Region 7 TMDL Review Forms which summarize the rationale for EPA's approval of these TMDL documents. EPA believes the separate elements of the TMDLs described in the enclosed forms adequately address the pollutants of concern through assessment of loading capacity, consideration of seasonal variation, and margin of safety.

Under Section 7 of the Endangered Species Act, EPA is currently consulting with the U.S. Fish and Wildlife Service regarding these TMDLs. While EPA is approving these TMDLs, EPA may decide in the future that changes to these TMDLs are warranted based upon the results of the consultation.

We appreciate the thoughtful effort that MDNR has put into these TMDLs. We will continue to cooperate and assist MDNR in developing future TMDLs.

Sincerely,

William A. Spratlin
Director
Water, Wetlands and Pesticides Division

Enclosure

cc: Anne Peery,
Missouri Department of Natural Resources

Phil Schroeder
Missouri Department of Natural Resources

Gerald Babao
American Canoe Association

Paul Sanford
American Canoe Association

Scott Dye
Sierra Club

John Simpson
KS Natural Resource Council

Mr. Edward Galbraith, Director
Water Protection Program
Water Protection and Soil Conservation Division
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102

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Re: Approval of Mississippi and Missouri rivers TMDLs

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WWPD/WQMB:Perkins:MCx7490:10-24-06:H:WQMB/2006 Correspondence/Perkins/MO and MS Rivers.doc

WQMB	CNSL	CNSL	WQMB	WWPD/IO	WWPD/IO
Perkins	Bagley	Cozad	DeLashmit	Berry	Spratlin
		A. Ashor AA	JAD	NOV 03 2006	
10/31 /06	10/31/06	10/31 /06	11/2/06	11/ /06	11/ /06

Sincerely,

William A. Spratlin
Director
Water, Wetlands and Pesticides Division

Enclosure

cc: Anne Peery,
Missouri Department of Natural Resources

Phil Schroeder
Missouri Department of Natural Resources

Gerald Babao
American Canoe Association

Paul Sanford
American Canoe Association

Scott Dye
Sierra Club

John Simpson
KS Natural Resource Council

EPA Region 7 TMDL Review

TMDL ID:	MO1604, MO0701, MO0356, MO0226	**Waterbody ID:**	MO1604, MO0701, MO0356, MO0226
Waterbody Name:	MISSOURI RIVER		
Tributary:			
Pollutant:	CHLORDANE and PCB		
State:	MO	**HUC:**	10240001, 10240005, 10240011, 10300101, 10300102, 10300200
BASIN:	MISSOURI RIVER		
Submittal Date:	10/11/2006		
Approved:	Yes		

Submittal Letter

State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.

Missouri submitted this TMDL in a letter dated October 6, 2006 and received by EPA October 11, 2006.

Water Quality Standards Attainment

The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.

The listing pollutants are targeted directly. The numeric criterion for chlordane in water is 0.00048 ug/L and for PCB in water is 0.000045ug/L for the impaired use (human health associated with fish consumption). Average fish tissue concentrations are below threshold levels of 0.1 mg/kg of chlordane (sum of isomers) and 2.0 mg/kg of total PCBs in fish tissue. The targeted loading capacity is zero (0) pounds/day. This should result in the attainment of water quality standards.

Numeric Target(s)

Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

The numeric criterion for chlordane in water is 0.00048 ug/L and for PCB in water is 0.000045ug/L for the impaired use (human health associated with fish consumption).

Beneficial Uses for Missouri River:

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life and Human Health – Fish Consumption
- Whole Body Contact Recreation, Category B
- Secondary Contact Recreation
- Irrigation
- Drinking Water Supply
- Industrial

Numeric Target(s) and Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.

Links in the TMDL are direct for load and indirect for the TMDL endpoint.
The department uses threshold levels of 0.1 mg/kg of chlordane (sum of isomers) and 2.0 mg/kg of total PCBs in fish tissue to determine support of the designated use. Because DHSS has a revised fish advisory methodology that follows EPA guidance, the threshold value for PCBs will change. The new threshold value for unrestricted consumption will be 0.04 mg/kg of total PCBs in fish tissue. If the average levels of these compounds exceed these levels in fillets of the fish sampled, the water body is considered to be not supporting the fish consumption use. These will be used for the endpoints for these TMDLs and the achievement of these targets should lead to the removal of fish consumption advisories. Missouri's protocol for removing or down grading an advisory requires at least two years of data below these targets.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.

Discussion of sources for both pollutants includes the history of their manufacture and cessation of manufacture. The pollutants' historic uses and present uses, for PCBs, are discussed. Additionally, the submittal discusses the possible routes of loading through illicit use and disposal and the route of bioaccumulation in the fatty tissues of fishes. It appears all sources have been considered.

Allocation

Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.

The TMDL is zero (0) pounds/day as are the LA and WLA for both pollutants.

WLA Comment

Since chlordane and PCBs were banned in 1988 and 1977, respectively, there should be negligible discharge of chlordane and PCBs into streams from wastewater treatment plants and other point sources. Therefore, the WLA is set as zero pounds/day in this TMDL.

LA Comment

Since chlordane and PCBs were banned, there will be only minor and/or infrequent application of chlordane anywhere that might be discharged under runoff conditions and enter the river. As time passes, this, too, will decline. Therefore, the LA is set as zero pounds/day in this TMDL.

Margin of Safety

Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.

The MOS is implicit. In order to ensure there is no threat of chlordane and PCB levels impairing fish consumption, fish advisories will remain in effect until all samples taken from fish have met the desired endpoint for two years. The department will coordinate with DHSS in guarding against threats to human health associated with fish consumption from these two contaminants.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).

This TMDL endpoint targets fish tissue concentrations of the pollutants. Incorporation of biomagnified pollutants into fish tissue is the result of seasonal processes in fishes life stages and addresses seasonal variation.

Public Participation

Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).

This TMDL was on public notice from June 9 to July 9, 2006. Due to comments received during the first notice period, which resulted in substantial changes to the TMDL document, a second public notice period was needed. This period was from Aug. 30 to Sept. 29, 2006. Groups who received the public notice announcement included the Missouri Clean Water Commission, the Water Quality Coordinating Committee, the water quality departments in neighboring states where the Missouri River is a shared border (Kansas and Nebraska), 155 Stream Team volunteers in the watershed, and the 51 legislators representing all the counties bordering this river. Also, the department posted the notice, the Missouri River Information Sheet and this document on its Web site, making them available to anyone with access to the Web. The department has placed a copy of the notice, the comments received and its responses in the Missouri River file.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).

This is a phased TMDL, which means that if future data indicates fish tissue chlordane and PCB levels are not continuing to decline, this TMDL will be re-evaluated. This TMDL will be incorporated into Missouri's Water Quality Management Plan.

MDC, the U.S. Environmental Protection Agency (EPA) and the department all provide fish tissue sample results to the Missouri Department of Health and Senior Services (DHSS) for use in determining health risks to fish consumers. DHSS, in turn, issues fish consumption advisories. DHSS has issued advisories based on pesticide contaminants in fish since 1985.

Reasonable assurance

Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.

No reasonable assurances are required. The WLA is set at the lowest possible load.

Section

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10/20/06

Tabatha Adkins/WWPD/R7/USEPA/US

10/20/2006 04:51 PM

To rick_hansen@fws.gov, andy_roberts@fws.gov, charlie_scott@fws.gov
cc John Delashmit/WWPD/R7/USEPA/US@EPA
bcc Tabatha Adkins/WWPD/R7/USEPA/US
Subject Fw: TMDL for the Missouri and Mississippi Rivers

Charlie,Rick, or Andy,

Hi, I wanted to let you know that we have seven MDNR developed TMDLs formally submitted to EPA.

Missouri River, WBID-1604 (100 miles), Atchison, Holt, Andrew, Buchanan, Platte, Clay, Jackson, Ray, Lafayette, Carroll, Saline, Chariton, Howard, Cooper, Moniteau, Boone, Cole, Callaway, Osage, Montgomery, Gasconade, Warren, Franklin, St. Charles and St. Louis Counties, Chlordane and Poly Chlorinated Biphenyls (PCBs), bald eagle, Indiana bat, pallid sturgeon, Least tern, Topeka shiner, Gray bat, Pink mucket, Niangua darter, Scaleshell, Winged mapleleaf, and any Critical Habitat.

Missouri River, WBID-0701 (129 miles), Atchison, Holt, Andrew, Buchanan, Platte, Clay, Jackson, Ray, Lafayette, Carroll, Saline, Chariton, Howard, Cooper, Moniteau, Boone, Cole, Callaway, Osage, Montgomery, Gasconade, Warren, Franklin, St. Charles and St. Louis Counties, Chlordane and Poly Chlorinated Biphenyls (PCBs), bald eagle, Indiana bat, pallid sturgeon, Least tern, Topeka shiner, Gray bat, Pink mucket, Niangua darter, Scaleshell, Winged mapleleaf, and any Critical Habitat.

Missouri River, WBID-0356 (125 miles), Atchison, Holt, Andrew, Buchanan, Platte, Clay, Jackson, Ray, Lafayette, Carroll, Saline, Chariton, Howard, Cooper, Moniteau, Boone, Cole, Callaway, Osage, Montgomery, Gasconade, Warren, Franklin, St. Charles and St. Louis Counties, Chlordane and Poly Chlorinated Biphenyls (PCBs), bald eagle, Indiana bat, pallid sturgeon, Least tern, Topeka shiner, Gray bat, Pink mucket, Niangua darter, Scaleshell, Winged mapleleaf, and any Critical Habitat.

Missouri River, WBID-0226 (179 miles), Atchison, Holt, Andrew, Buchanan, Platte, Clay, Jackson, Ray, Lafayette, Carroll, Saline, Chariton, Howard, Cooper, Moniteau, Boone, Cole, Callaway, Osage, Montgomery, Gasconade, Warren, Franklin, St. Charles and St. Louis Counties, Chlordane and Poly Chlorinated Biphenyls (PCBs), bald eagle, Indiana bat, pallid sturgeon, Least tern, Topeka shiner, Gray bat, Pink mucket, Niangua darter, Scaleshell, Winged mapleleaf, and any Critical Habitat.

Mississippi River, WBID-0001 (165 miles), Clark, Lewis, Marion, Ralls, Pike, Lincoln, St. Charles, St. Louis, Jefferson, Ste. Genevieve, Perry, Cape Girardeau, Scott, Mississippi, New Madrid and Pemiscot, Chlordane and Poly Chlorinated Biphenyls (PCBs), Gray Bat, Indiana bat, bald eagle, pallid sturgeon, Pink mucket, scaleshell, Least tern, Fat pocketbook, Interior least tern, Higgins eye pearly mussel, Topeka shiner, and Critical Habitat.

Mississippi River, WBID-03152 (124.5 miles), Clark, Lewis, Marion, Ralls, Pike, Lincoln, St. Charles, St. Louis, Jefferson, Ste. Genevieve, Perry, Cape Girardeau, Scott, Mississippi, New Madrid and Pemiscot, Chlordane and Poly Chlorinated Biphenyls (PCBs), Gray Bat, Indiana bat, bald eagle, pallid sturgeon, Pink mucket, scaleshell, Least tern, Fat pocketbook, Interior least tern, Higgins eye pearly mussel, Topeka shiner, and Critical Habitat.

Mississippi River, WBID-01707 (200.5 miles), Clark, Lewis, Marion, Ralls, Pike, Lincoln, St. Charles, St. Louis, Jefferson, Ste. Genevieve, Perry, Cape Girardeau, Scott, Mississippi, New Madrid and Pemiscot, Chlordane and Poly Chlorinated Biphenyls (PCBs), Gray Bat, Indiana bat, bald eagle, pallid sturgeon, Pink mucket, scaleshell, Least tern, Fat pocketbook, Interior least tern, Higgins eye pearly mussel, Topeka shiner, and Critical Habitat.

EPA is in the process of approving these TMDLs and believe that they do not meet the 2 exceptions stated, whereby USFWS would conditionally concur on TMDL approvals except in the cases of:

1. Any TMDL developed that requires modification of flows from impoundments either within the state of Missouri or outside the state on a waterbody containing federally listed species would need to have formal consultation conducted.
2. If a TMDL for a waterbody containing federally listed species is proposed or implemented, but it is determined that meeting the standard criteria is unattainable for any reason, a formal consultation would need to be conducted for that waterbody.

I am attaching a link to MDNRs website for you to review the TMDLs. Please let me know if you have any questions. Thanks.

http://www.dnr.mo.gov/env/wpp/wpcp-pn.htm

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